The Electrical Industry's Weekly Magazine

April 17, 1961

Electrical World

Price 50 Cents

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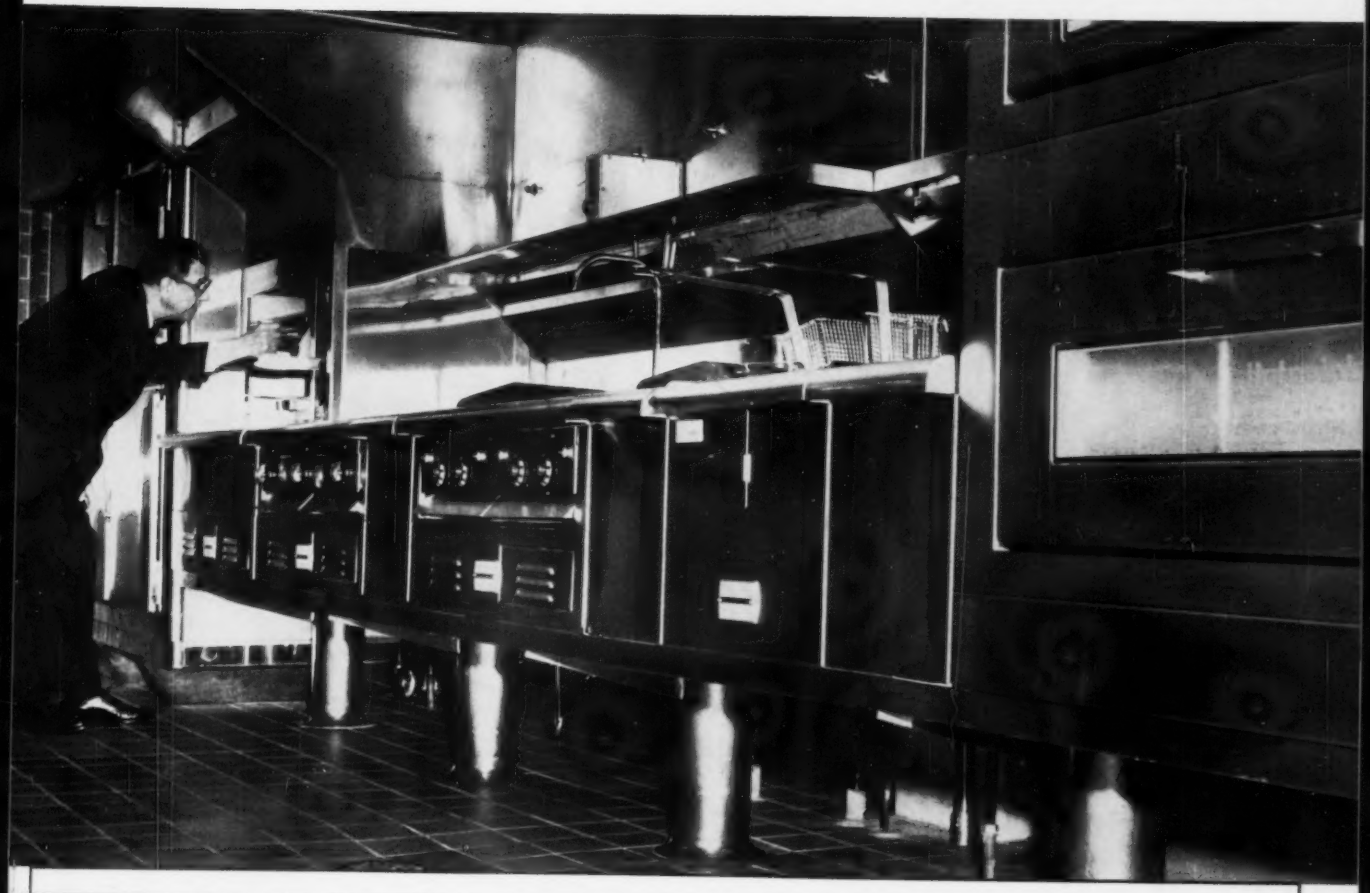

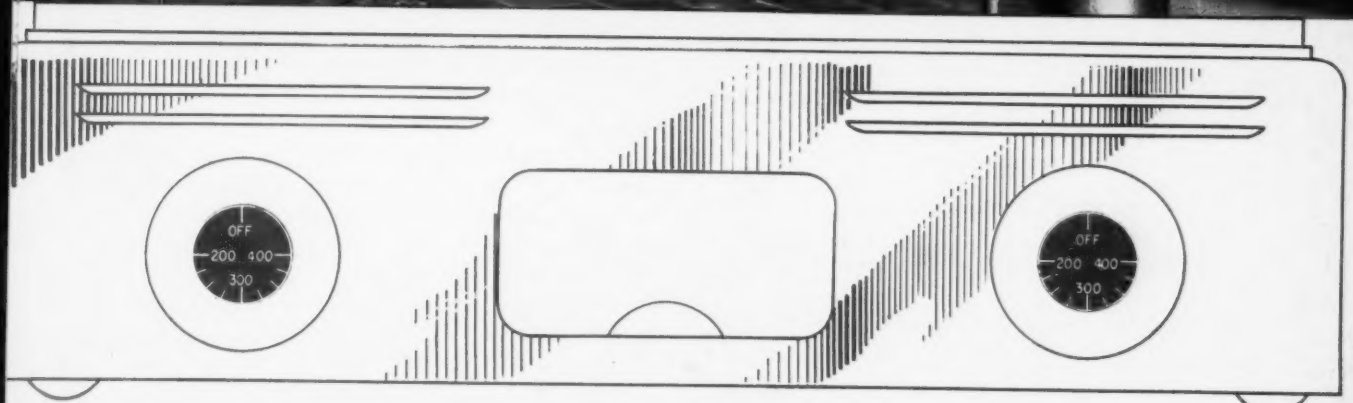

Commercial Cooking Survey

...page 65

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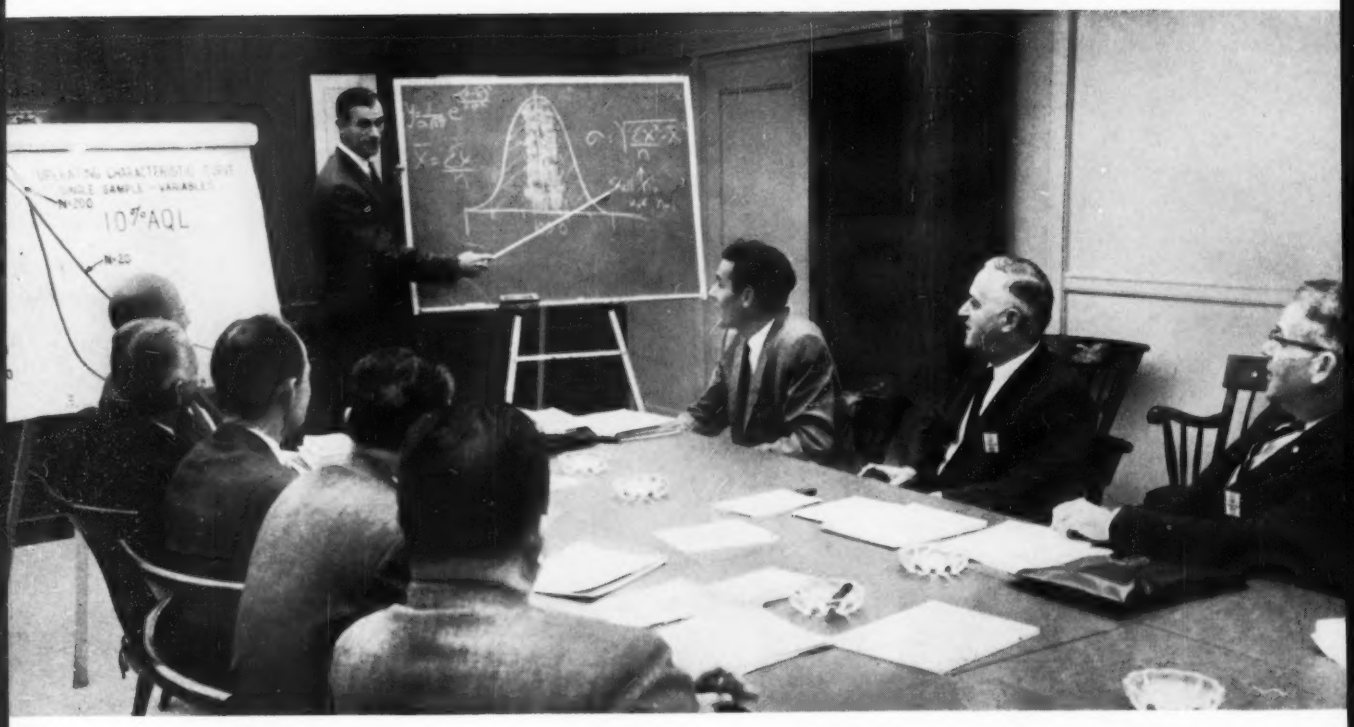


Meter sample testing

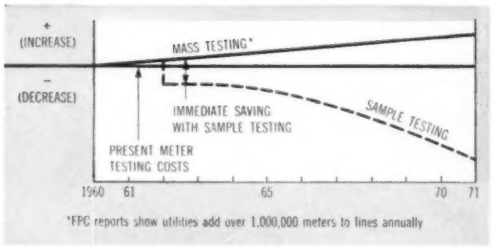
Seminars point up $70 million possible annual saving

The electric utility industry can save an estimated $70,000,000 annually in testing costs by 1971 through universal use of meter sample testing. Twenty-one utilities have already substantially reduced the cost of testing in-service meters by this method whose validity has been thoroughly established and recognized by many utility regulatory commissions; fourteen more are known to be studying its application to their own systems.

General Electric, which has employed statistical sample testing techniques for 10 years in the manufacture of precision watthour and demand meters, shares its accumulated knowledge with electric utilities by conducting sample testing seminars at Somersworth, N. H. Representatives from 62 utilities have attended during the past three years.

Savings to be obtained through sample testing of in-service meters can be added to savings already realized by elimination of the testing of each meter "as received." The latter savings are the outcome of General Electric's proved ability, over the past 10 years, to provide its customers with meters of uniform, certified accuracy.

For information on techniques of sample testing as applied to meters, and how their use can benefit your utility, contact your G-E Sales Engineer or write to General Electric Co., Somersworth, N. H. 604-14



FIRST-YEAR AND CONTINUOUS SAVINGS result from sample testing. Savings will increase as older meters are replaced by General Electric magnetic-suspension meters, which also provide increased revenue through improved meter accuracy.

GENERAL ELECTRIC

Published for 87 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

APRIL 17, 1961
Vol. 155, No. 16

Dateline . . .

Federal Agency Reforms Are Coming

Washington, D. C.—the period of criticism and study of the federal regulatory agencies is about to end, to be replaced by a period of activity in forging reforms.

What will the changes be? How will they be made? How soon will they come?

Answers to these questions are beginning to take shape in stirrings from the White House and Congress, and there is optimism that such agencies as the Federal Power Commission, the Atomic Energy Commission, and the Securities & Exchange Commission may be sharply improved.

In a period when sweeping indictments of the agencies have come from the Administration, in the report of James M. Landis, and from Congress, in reports from Rep Oren Harris' Commerce Committee and Sen John A. Carroll's Judiciary subcommittee, important efforts by the agencies to lift themselves by their own bootstraps have been largely overlooked.

In this respect, a partial answer to the question of when reform will come is "now."

The FPC, for example, started using pre-hearing conference techniques as a means of shortening and simplifying hearings long before Landis, President Kennedy's advisor on the agencies, suggested the method. The AEC, on its own, has tried to meet criticism of its operations by separating its policing activities from its promotional activities. And the Interstate Commerce Commission had increased the administrative powers of its chairman, another reform endorsed by Landis.

Still, many improvements must be approved by Congress, and the time has come for Kennedy and Landis to work out the changes they want with Congressional leaders.

A wide range of reforms seems to have the support of important legislators in both parties. These include lengthening terms of commissioners, giving some of the agencies more funds, and raising the prestige of hearings examiners by giving them

(*Continued on page 5*)

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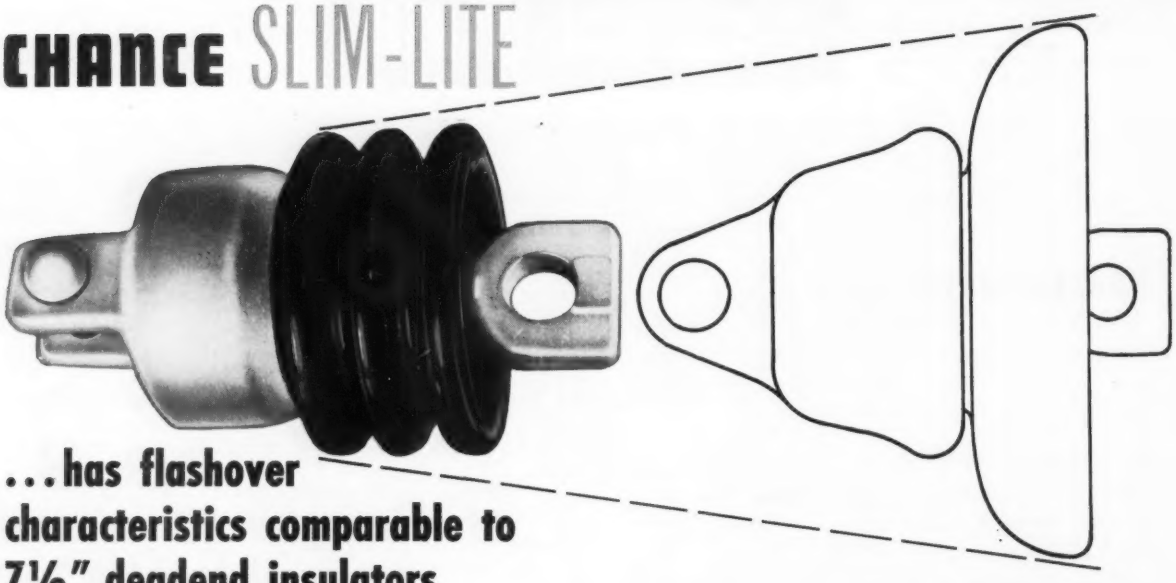


...has flashover characteristics comparable to 7½" deadend insulators

Here are the reasons why the new Chance Slim-Lite deadend insulator has already been adopted by several utilities since its introduction last fall. A major reason is the design that gives this 4¼" insulator flashover characteristics comparable to standard 7½" insulators that cost 50% more. Puncture voltage rating is 20% higher than 7½" discs.

ALUMINUM caps and studs resist corrosion...have longer service life

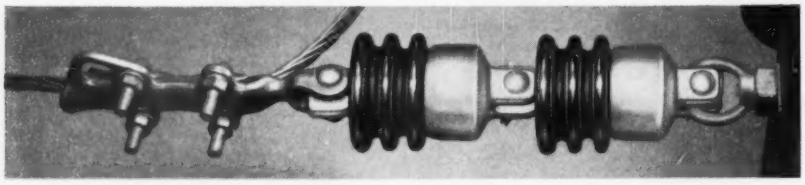
The aluminum alloy hardware on this insulator is another important reason for its acceptance. High resistance to corrosion means longer life...more for your money. Salt fog tests show definite superiority. Accelerated Weatherometer tests (equivalent to 10 years service in unfavorable conditions) show no adverse affect on the hardware.

LIGHT WEIGHT and square tongue for easier handling with less breakage

The light weight is important two ways . . . both handling and transportation are easier and less costly. The square tongue design prevents breakage where two insulators are used together . . . especially important in slack span construction. Combined mechanical and electrical strength . . . 10,000 lbs.

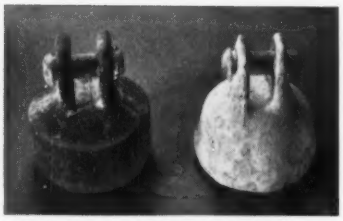
ALUMINUM DISSIPATES HEAT . . . reduces porcelain damage

Aluminum hardware (an excellent conductor) has the advantage of fast heat dissipation during faults or surges . . . protects the porcelain.

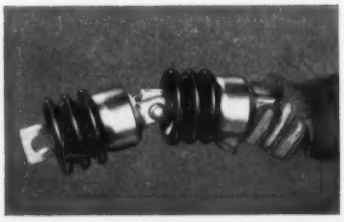


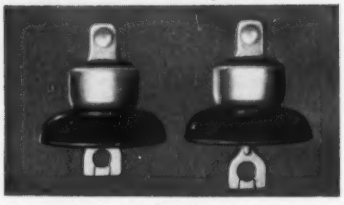
NEAT STREAMLINED APPEARANCE . . . easier to cover or work hot

New subdivisions demand attractive appearance, and maintenance crews like construction that is easy to work. The Slim-Lite is compact...easy to cover...easy to work hot. Its compactness simplifies three-wire aerial terminations.



Aluminum cap (left) compared to ferrous cap (right) exposed to 500 hour salt fog test. Left...little effect. Right...badly corroded.





ALUMINUM ALLOY HARDWARE is also available with long or short stud on Chance 6" bell type deadend insulators.

A. B. CHANCE CO.

Centralia, Missouri

A. B. Chance Co. of Canada, Ltd., Toronto

C161-10

Dateline . . .

Washington, D. C. (*Continued from page* 3)
broader authority to make final decisions.

Such ideas as these could well be adopted very quickly, under Kennedy's authority to make proposals under the Reorganization Act.

In proposing changes, Kennedy will have to deal diplomatically to avoid offending Congressional leaders. There is considerable resentment that Landis has grabbed the spotlight from Harris and Sen Warren G. Magnuson, whose respective committees on Interstate and Foreign Commerce oversee the agencies.

Harris speaks acidly of the "the so-called Dean Landis report," and he and Magnuson have served notice that they will hold hearings on any changes in the agencies proposed under the Reorganization Act, despite the fact that their committees don't have direct jurisdiction.

The latest report on the agencies, from Carroll's subcommittee, gives support to an idea of Landis' that is anathema to many Congressmen: a formal White House Office of Administration & Reorganization.

Harris and others have flared at the suggestion that Congress has given up any authority over the agencies, and their reaction caused Kennedy to back off the idea of a regular agency overseer in the White House.

Nevertheless, one of the keystones of Landis' program for reform is policy coordination among agencies with activities in the same field.

This idea involves, for example, the formulation of consistent policies for all the agencies dealing with fuels—the FPC, AEC, ICC and Interior Department.

One of the long-range sources of conflict in changing the agencies will certainly revolve around this proposal for more coordination.

Letters

Comments on '. . . Water Scare' Article

To the Editor:

The Management Newsletter of Jan. 30 entitled "Water Shortage or Water Scare?" has been brought to my attention. As I am the "leading biologist" mentioned on page 60, I would like to comment:

Paragraph 1—"The Water Problem" should certainly be brought to the attention of the public in a democracy. . . . I believe that most Americans will ask the question, "What can we do about this problem?" (Then say,) "Let's go to work and find out what can be done."

Paragraph 4—"Dilution is never a solution to pollution." How could it be? We are very much aware that under present states of knowledge the full application of certain pollution laws might be disastrous to some industries and many communities. However, we are . . . way behind other countries in research.

Paragraph 5—I am well aware of the "growing attention to heat (thermal) pollution." It is a world wide problem. I have recently spent three months in England studying their solutions to this problem. We could gain much by more study of areas other than the US.

Paragraph 6—Much could be gained by lessening the disastrous competition between industries, municipalities, states, and federal government organizations. The last statement in this paragraph, "Proponents of federal control have already raised the question of injecting such immeasurable qualities as esthetics and recreation more heavily into cost-benefit ratios of multi-purpose projects, making many presently unjustifiable projects come within the realm of feasibility," is very enlightening. If any group or any industry believes that this is bad business they certainly will be rudely shocked in years to come. The chance for a youngster to catch a fish, see a sunset, or hear the waves hitting a shore may be immeasurable in a cost program, but it is still invaluable. Whether any particular group wishes it or not, the American people are going to get it . . . The greatest of all human values are immeasurable. That is the way we were made.

Paragraph 9—I agree. "Lack of knowledge is the biggest water problem."

(*Continued on page* 108)

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Postmaster . . . Please send form 3579 to Electrical World, 330 W. 42nd St., New York 36, N. Y.

(Advertisement)

Control of thermal expansion in piping

Flexible support can prevent destructive stresses in high temperature piping

Heat 100 linear feet of alloy steel pipe to 1000°F, and it will expand approximately 9 inches! When this thermal expansion takes place in a piping system, the resultant forces — if uncontrolled — can do incalculable harm.

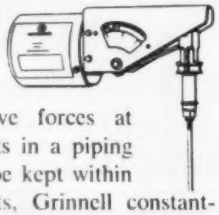
Helical coil springs

Using helical coil springs to compensate for thermal expansion in piping is now common practice. However, designing or selecting flexible supports is often done haphazardly. In fact, any specifications covering the support of important high temperature piping simply say "spring hangers shall be provided." But it is not enough to merely admit that thermal expansion may be dangerous.

Safety of entire system at stake

Careful study must be given to the design and selection of spring supports which will maintain a balanced piping system. If not, the transfer of weight from one hanger to another, or from a hanger to a terminal point, will endanger the safety factor of the entire system. Today, you're often confronted with 8–9–even 10 inches of thermal deflection. That's why flexible support for piping in all positions of travel is a definite "must"!

Constant-support hangers

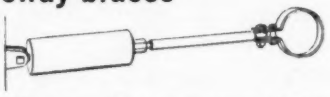


Where reactive forces at terminal points in a piping system must be kept within specified limits, Grinnell constant-support type hangers are recommended. They are designed to provide uniform supporting force equal to the pipe load throughout the range of thermal movement. Constant-support hangers should be used at superheater outlets, turbine connections, and on high temperature and other critical lines.

Variable spring hangers

When pipe lines are subject to vertical movement — and restrictive conditions do not require a constant-support hanger — variable spring hangers are recommended. They should be designed for a maximum variation in supporting effect of 25% for the total travel resulting from thermal conditions.

Vibration control and sway braces

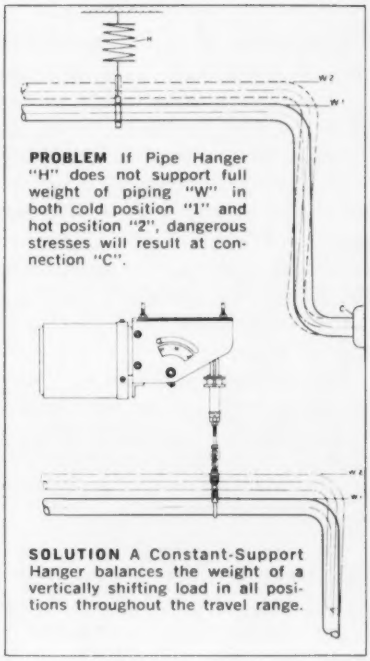


When you have to prevent abnormal movement or vibration in pipe lines, controls or sway braces of the energy-absorbing and instant-acting counter force type are recommended. They dampen vibration, oppose pipe sway, absorb shock.

Grinnell Hanger Engineering Service

Grinnell Company's Pipe Hanger Department offers design service to engineers who appreciate the specialized knowledge required. Grinnell will help you compute hanger loads . . . and select proper supports for a *balanced* pipe suspension system.

What's more, Grinnell manufactures a complete line of pipe hangers and supports — and offers stocks of pipe hangers close to any job!



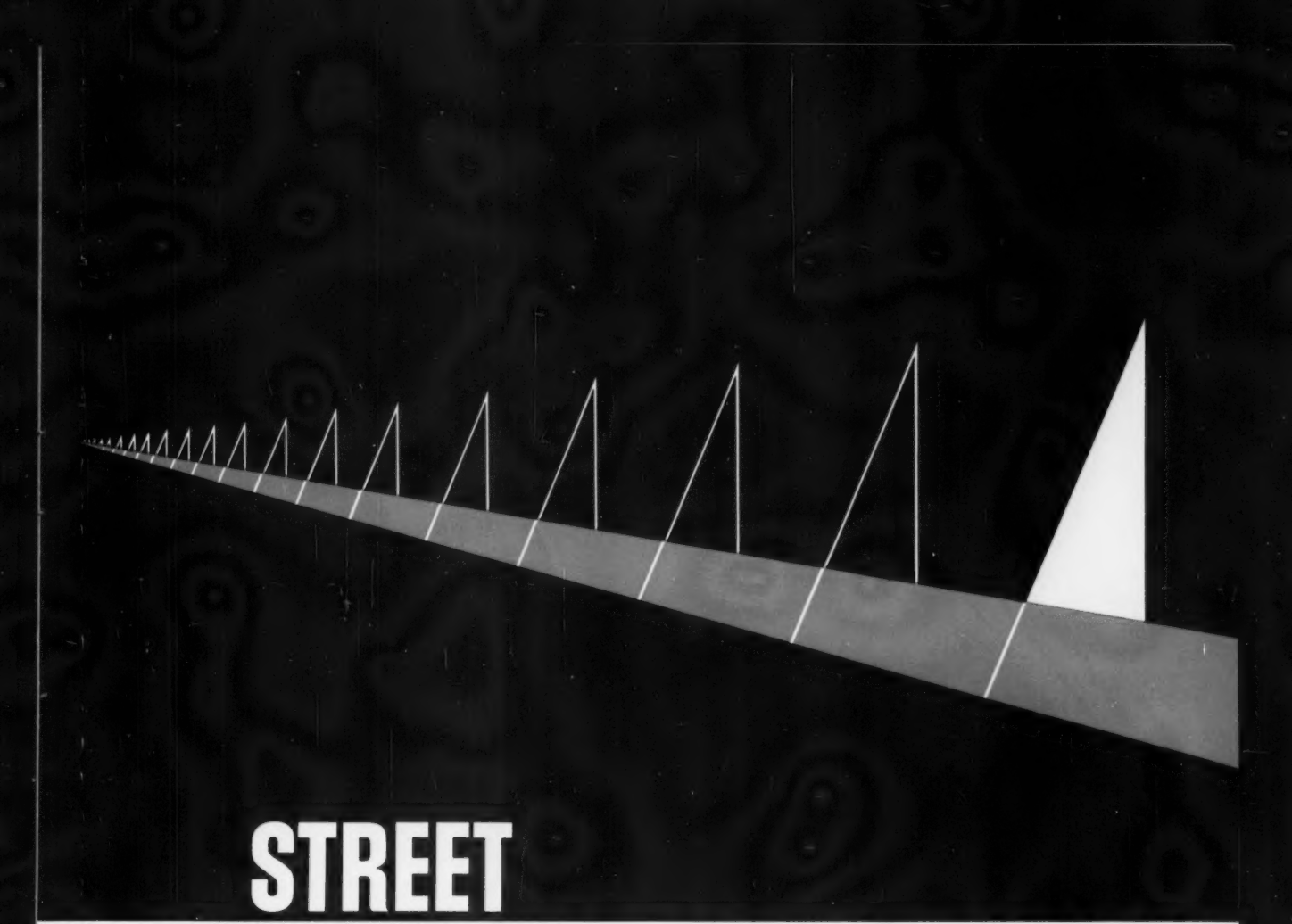
PROBLEM If Pipe Hanger "H" does not support full weight of piping "W" in both cold position "1" and hot position "2", dangerous stresses will result at connection "C".

SOLUTION A Constant-Support Hanger balances the weight of a vertically shifting load in all positions throughout the travel range.

Grinnell maintains an experienced staff of technicians to discover better ways of solving pipe suspension problems, too.

Hanger load calculation booklet

Grinnell will be glad to send you — without obligation — a 32-page booklet, "Calculations for Hanger Loads and Thermal Movements". This helpful booklet furnishes necessary data and procedures to determine pipe hanger loads and thermal movements. Tabulations of piping weights and thermal expansion are arranged for convenient selection of data that usually takes considerable time to develop. Send for your copy *today*. Grinnell Company, Providence 1, R. I. Branch Warehouses in Principal Cities.



STREET LIGHTING Your billion dollar market

An ultimate utility revenue of $1 billion from street lighting is the recent forecast of one authority. Lighting of residential streets and new highways, in particular, is an area where bigger volume is an immediate prospect.

Dependable, efficient luminaires and photoelectric controls . . . products to help you realize this market . . . are the exclusive business of American Electric Manufacturing Corp. Holophane glass refractors with prismatic construction assure precise light distribution in all standard IES patterns. Spun aluminum Alzak surface reflectors give maximum efficiency from the light source. All hardware is corrosion resistant. Cast aluminum heads are manufactured to latest EEI-NEMA standards for interchangeability of optical assemblies and controls. Outstanding reliability of American Electric photocells has been proved in thousands of installations.

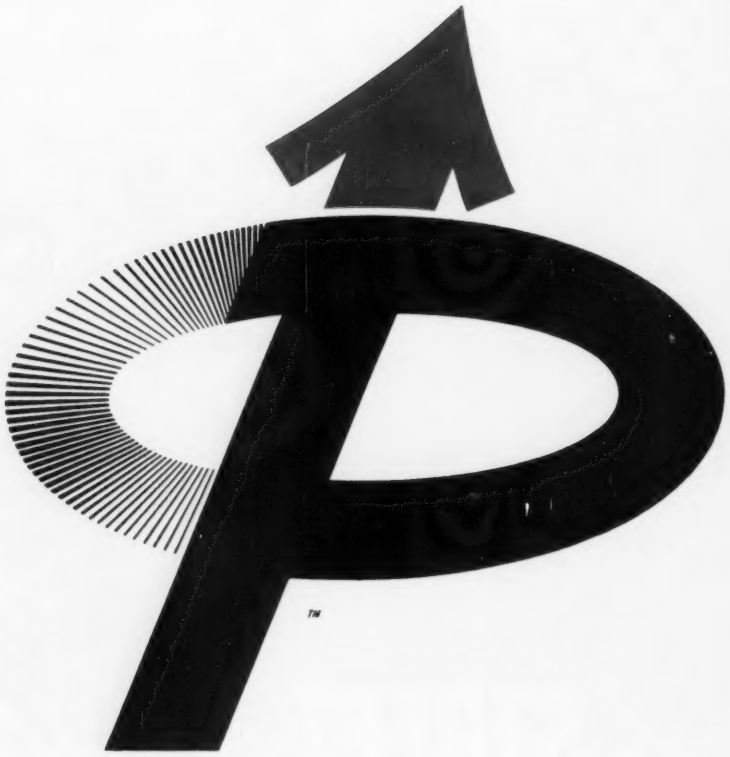
In street lighting equipment, American Electric is equipped to give you fast, efficient service and to handle your special requirements economically. Write today for catalog.

OPEN BOTTOM LUMINAIRE FOR RESIDENTIAL LIGHTING

Cleaning maintenance is eliminated in this modern luminaire for residential and security lighting applications. The open bottom makes it self-cleaning, and speeds re-lamping. Available for either incandescent or mercury vapor (with built-in ballast) lamps and with or without photoelectric control.

a/e STREET LIGHTING

American Electric Manufacturing Corp., 3271 Chelsea, Memphis 8, Tenn., *Representatives throughout the U.S.*



THIS SYMBOL —introduced to you just one year ago—

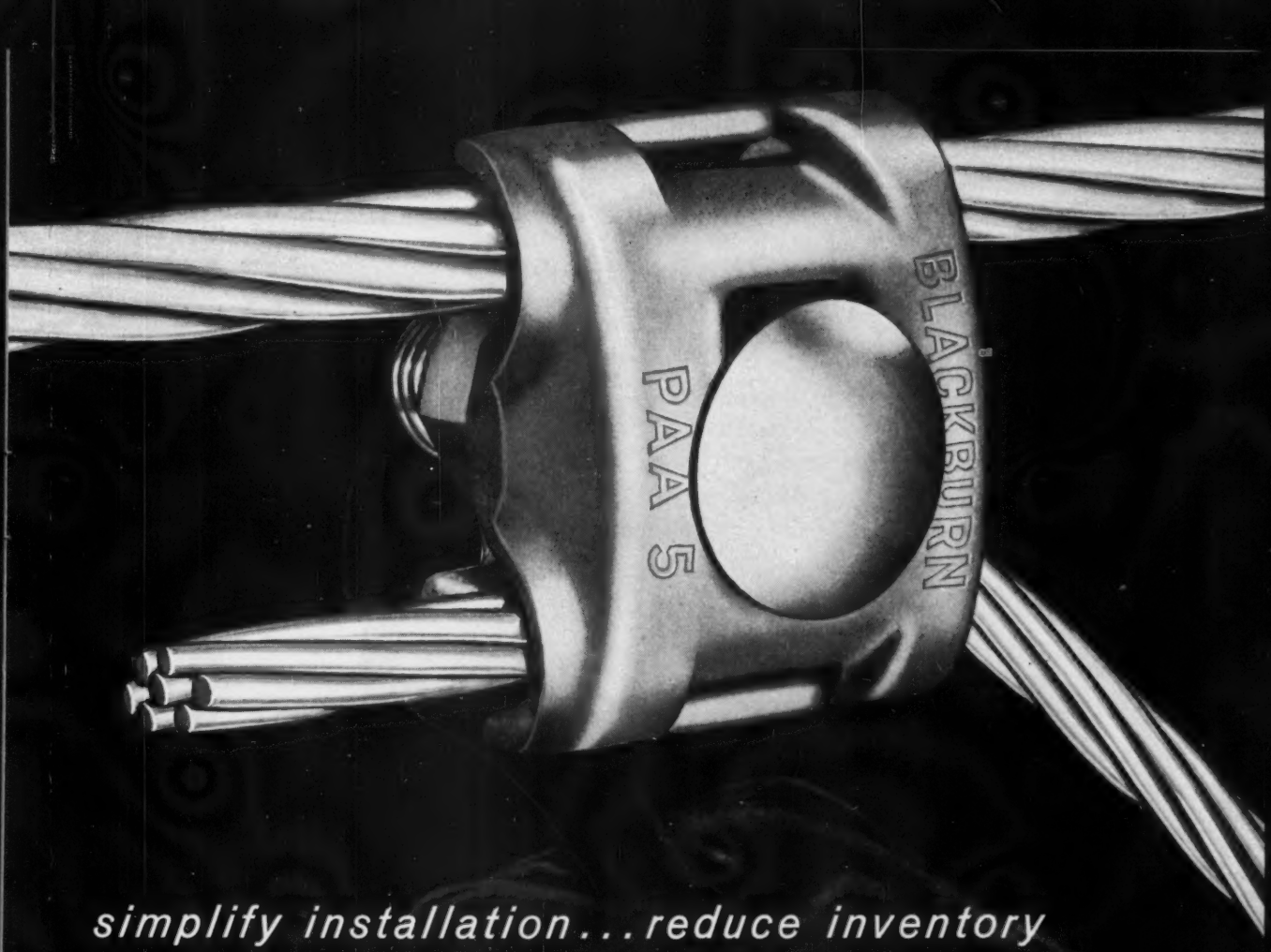
captured a completely new concept in

hydraulic lifting and digging equipment...

designed especially for electric utilities

WHAT'S NEW FROM PITMAN

Watch this page in next week's Electrical World!



simplify installation...reduce inventory

with BLACKBURN PARALLEL GROOVE CLAMPS

TWO sizes make up to 90% of the tap connections required on most distribution systems.

Tools normally carried by linemen are all you need to install Blackburn parallel groove clamps easily and properly. The problem of finding the right die inserts for specific connections is eliminated . . . the chance of human error is lessened.

Inventories can be reduced drastically. Only TWO clamp sizes take wire sizes from 8 solid to 336.4 ACSR, with taps from 8 solid to 1/0 ACSR.

Use these clamps on **aluminum** . . . also on **aluminum to copper** when prefilled with Contax, an oxide-inhibiting paste non-injurious to natural rubber. This also simplifies stocking, reduces the types of clamps needed in warehouses and on line trucks.

For the few installations outside 8 solid—336.4 ACSR main and 8 solid—1/0 ACSR tap range, other sizes are available.

Blackburn parallel groove clamps are engineered for high resistance to weathering, galvanic corrosion, vibration and other enemies of good connections. Construction is of high-strength aluminum alloy, with rocker and spring action to counteract differences in coefficient of expansion when used for bi-metallic connections.

For complete information and test data, send for Bulletin #6007. Samples on request.

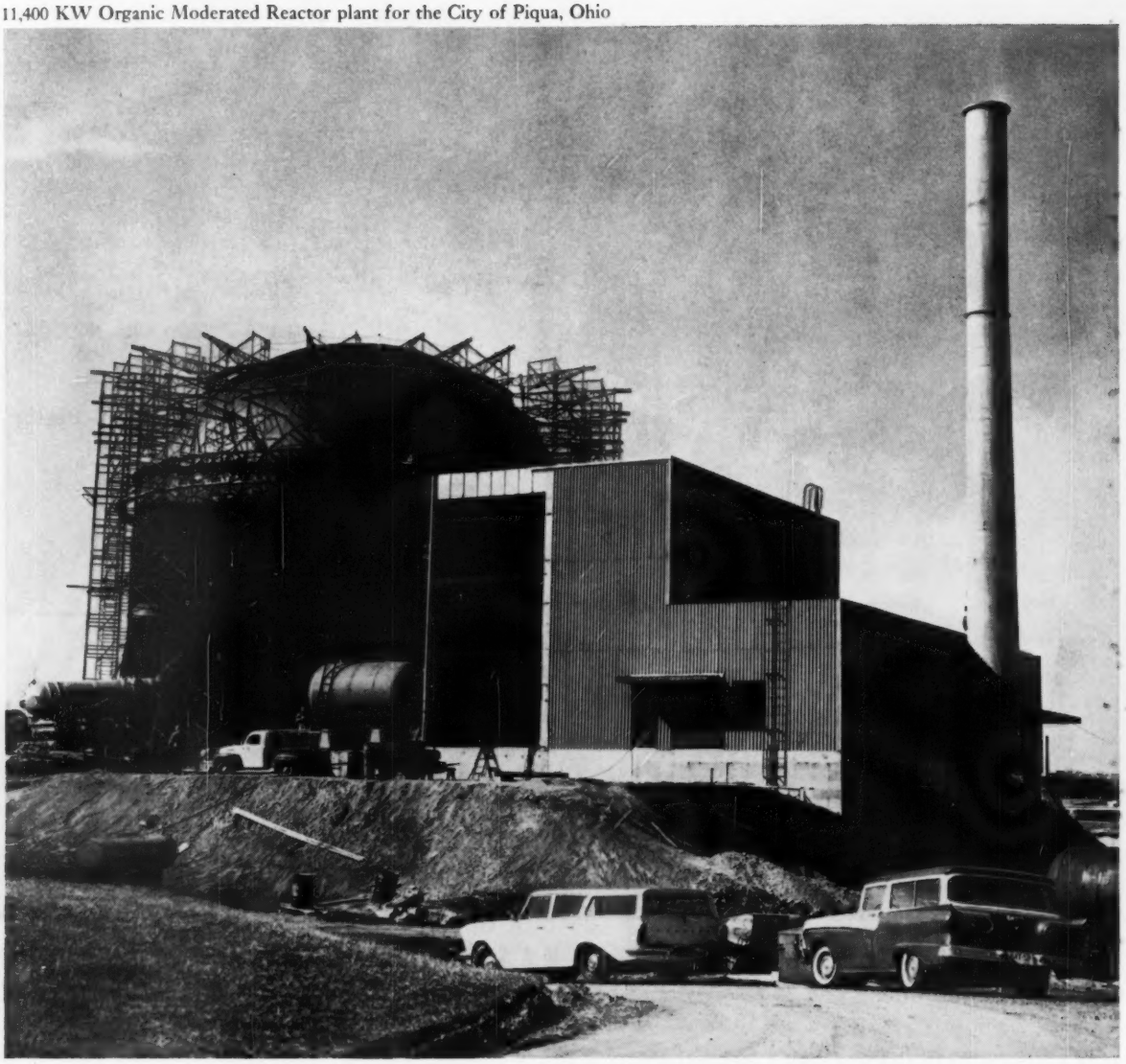
Jasper

BLACKBURN

Corporation

1525 Woodson Road • Saint Louis 14, Missouri

11,400 KW Organic Moderated Reactor plant for the City of Piqua, Ohio



The Peaceful Atom

Answering the challenge of the Sixties: to double the world's power output in ten years

To meet increased living standards everywhere, the world's power resources must be doubled in the 1960's. In this great expansion the Peaceful Atom will play an ever-increasing role. Atomics International, a leader in developing nuclear power for over 15 years, is already building two of the world's most advanced power stations under AEC programs: the Organic Reactor plant at Piqua, Ohio and the Sodium Reactor plant at Hallam, Nebraska. Another promising concept is the Advanced Epithermal Thorium Reactor project, now being developed by AI for the Southwest Atomic Energy Associates, a group of investor-owned utilities. AI's experience and facilities will play a growing part in meeting the power challenge of the Sixties.

ATOMICS INTERNATIONAL

Division of North American Aviation

Pioneers in the creative use of the atom

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You get more value for the same dollar— in the NEW Bulletin 709 line of starters!

This new line of Allen-Bradley motor control will change every idea you have had about starter size, performance, and life. The small size—especially in the higher ratings—is startling. Yet rating for rating the operating life and reliability have been increased many times. Built into each of the seven sizes of this new Allen-Bradley line is an ability to interrupt tremendous currents and to operate year in and year out for many millions of operations without trouble or maintenance.

The new Bulletin 709 starters are just as advanced in appearance as they are in performance. All seven sizes have an aristocratic styling and a distinctive family likeness. Brooks Stevens, famous industrial designer, has given the enclosures such an attractive, modern style that these new starters will prove a distinct sales asset on any machine or installation.

Why not write today for more information on this revolutionary new line of Allen-Bradley Bulletin 709 *quality* across-the-line motor starters?

Note the compactness of both the smallest and largest starter in the new Bulletin 709 line. Ratings up to 100 hp, 220 v; 200 hp, 440-550 v.

10-61-PM

ALLEN-BRADLEY

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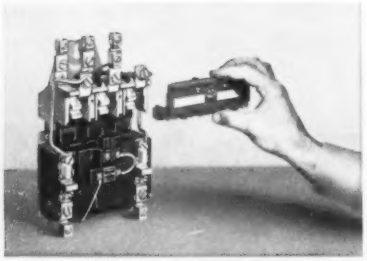
Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

QUALITY MOTOR CONTROL

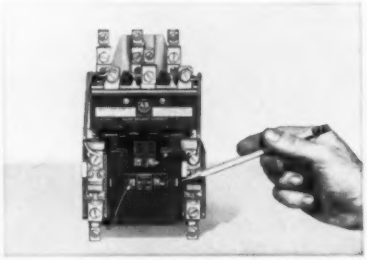
Features of the NEW Allen-Bradley starter line that are of value to you!

New Bulletin 709 Size 3 across-the-line motor starter. Note the generous space for wiring, accessible terminals, and white interior.

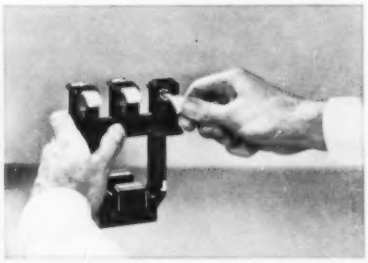
Every detail of the new Allen-Bradley motor starters has been designed to help make this the best line of motor control on the market. Remarkably small in size, each starter is a giant in performance. Being light in weight, these starters are easy to handle and a cinch to install. The generous wiring space, full front wiring, white interiors, and convenient knockouts make installation easy. The enclosure cover is firmly held with a quarter-turn fastener. All installation, inspection, and maintenance operations can be handled from the front—as shown in the illustrations below—without the use of special tools.



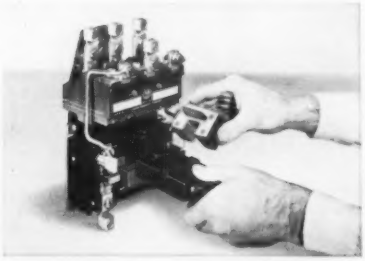
QUICK, EASY CONTACT INSPECTION—When the arc hood front cover is removed by loosening two captive screws, contacts are plainly visible from the front.



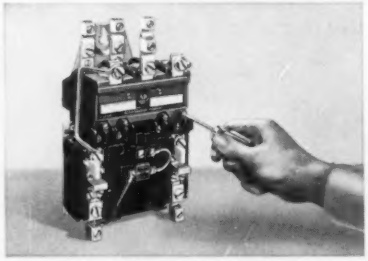
CONTACT POSITION INDICATED—Two slots in the coil cover show the position of the movable contact support—tell whether contacts are "closed" or "open."



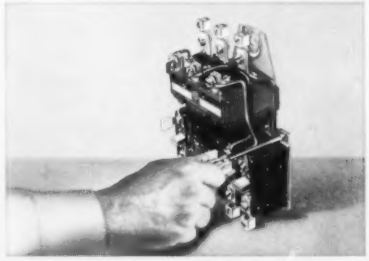
CONTACTS EASILY REPLACED—Depress the spring slightly, and the movable contacts can be lifted out of the molded support and the new contacts slipped in.



COIL EASILY CHANGED—When the coil cover is removed, coil and magnet yoke can be lifted out from the front. They are impossible to replace incorrectly.



AUXILIARY CONTACTS EASILY ADDED to the front of the starter. Two extra auxiliaries can be added to Sizes 0, 1, and 2 starters, and four, to Sizes 3, 4, and 5.



A THIRD OVERLOAD RELAY CAN BE EASILY ADDED in the field, from the front of the starter. And the only tool needed is a common screwdriver.

ALLEN-BRADLEY

Member of NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

QUALITY MOTOR CONTROL

Electrical World

APRIL 17, 1961
Vol. 155, No. 16

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SECOND SPECIAL Electric Utility Methods report of the year is presented.

LATE NEWS ▶

Democrats on the Senate Anti-monopoly subcommittee beat down Republican objections to opening the probe into the electrical manufacturing antitrust cases. First session of the hearings was taken up with a wrangle among committee members over whether a hearing at this time would prejudice pending civil cases. Democrats favored the open hearings, but said they should not be used to put defendants in the antitrust cases in an unfair position.

President Kennedy singles out FPC in his regulatory message to Congress, saying these things must be done to clear up the agency's backlog: **(1)** Increase membership from five to seven; **(2)** Give the chairman clear responsibility for administration; **(3)** Make chairman's service at will of the President; **(4)** Exempt small gas producers from regulation, and concentrate on some 270 major producers who supply about 90% of interstate gas.

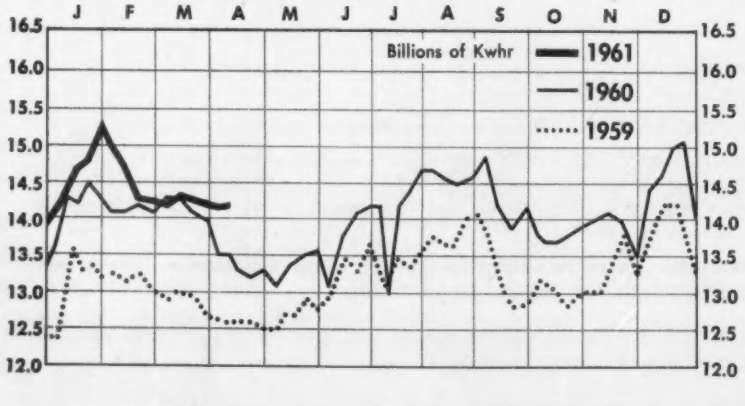
Foreign cable engineers flock to Elmira for AIEE EHV cable conference. Biggest foreign delegations are from Japan, Russia, France, and Britain. Cornell test facilities win good notices from off-shore cable experts. British and French engineers say they will begin 200-kv dc underwater tie between CEGB and Electricite de France in late May barring abnormal tidal conditions in the channel. British representatives indicate 400-kv cable test station may be built in two or three years to parallel proposed voltage increase in British grid from 275 to 400 kv. (EW April 10, 1961, p42.)

Chief executives of Iowa Power Pool announce basic policy that considers the five-company system (EW, June 9, 1858, p56) a single company system for generation and transmission planning. Members of the 1,400-Mw pool (Iowa EL&P, Iowa Southern Utilities, Iowa-Illinois G&E, Iowa PS, and Iowa P&L) view the new policy as opening a "whole new chapter in electric power planning in Iowa."

Operation of Dresden reactor faces additional delays as new problems develop with Type 405 stainless steel. Reactor was to resume operation in early May but tiny stress cracks have been found in the stainless steel core support. AEC is considering tests using only 10% of Dresden's total core.

FPC turns down long range coordination agreement between Grand River Dam Authority and Public Service of Oklahoma, questioning its legality. But Commission approves increase in Authority's generating capacity and retention of 1958 rate schedule between the Authority and Public Service. Kamo Electric Co-op had called the 1958 rate schedule unfair to the co-op and to the Authority.

WEEKLY POWER OUTPUT—Up 2.4% (Week ending Apr. 8), Kwhr 14,182,000,000



Percent Change From Previous Year

	Mar. 25	Apr. 1	Apr. 8
Total U. S. ...	+ 1.6	+ 1.9	+ 2.4
New Eng.	+ 5.0	+ 1.6	+ 2.5
Mid. Atlan.	+ 4.1	+ 2.1	+ 0.9
Cent. Indust...	− 2.7	− 3.0	− 3.5
West Cent.	+ 4.4	+ 3.8	+ 4.3
Southeast	− 2.2	+ 2.6	+ 5.7
South Cent.	+ 4.9	+ 6.6	+ 3.5
Rocky Mount...	+11.5	+11.2	+ 8.5
Pacific			
NW	+ 7.4	+ 1.9	+ 6.0
SW	+ 6.0	+ 5.4	+ 7.0

Seasonally Adjusted Index 285

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Source: Edison Electric Institute

Supply Lines

JUDGE DEFERS DECISION ON SECRECY OF GRAND JURY SUBPOENAS

A decision, spelling out who, if anyone should be allowed to see subpoenas issued during the Philadelphia grand jury investigations of the electrical manufacturers, is not expected for a couple of weeks. Federal Judge J. Cullen Ganey heard arguments from both sides April 12 during a 90-minute hearing, but about all that came out of it was that he wanted to see a set of the subpoenas himself to help him make a decision.

Those who argued for a look at the subpoenas were buyers of equipment that was involved in the antitrust cases, and included California, Minnesota, Pennsylvania, New York, Chicago, and Philadelphia, as well as the National Institute of Municipal Law Officers. The only investor-owned utility present was Philadelphia Electric Co, which also argued in behalf of releasing the information. Essentially, the general argument was that a look at the subpoenas would allow these buyers to proceed more rapidly and at much less expense in determining whether they were justified in suing the manufacturers for damages.

Those who opposed were some of the manufacturers indicted in the antitrust actions, individuals from Westinghouse Electric Corp, and S&C Electric Co and other companies. They maintained that releasing the subpoenas would violate the secrecy of the grand jury proceedings and in general would thus tend to diminish the effectiveness of future secret grand jury proceedings.

NEMA TO FORM COMMITTEE TO STUDY CODE OF ETHICS PROPOSAL

NEMA has turned over the Code of Ethics proposal to a committee. The proposal that NEMA draft such a code for the electrical industry was made recently by Westinghouse President Mark Cresap and later indirectly endorsed by Attorney General Robert Kennedy.

Last Tuesday, following a meeting of the NEMA board of governors, Managing Director Joseph F. Miller said of the proposal: "NEMA's own activities have historically been conducted under policies carefully drawn and enforced so as to ensure strict compliance with the laws. Nevertheless, in view of such public statements and in order fully to discharge its responsibilities to the electrical manufacturing industry, the Board decided that NEMA should explore the possibilities open to it to give guidance to its members. Accordingly, the President of NEMA has been authorized to appoint a committee to review the needs of the industry and to make appropriate recommendations to the next meeting" of the board.

KEFAUVER PROBE: WHAT HAPPENED INSIDE THE COMPANIES?

The first phase of Sen Estes Kefauver's probe of electrical manufacturers will deal with individuals and policies of the manufacturers involved in the Philadelphia cases. Later, the Senator may get into the subject of identical bids; but for the present, he will focus on what happened inside the companies.

"We want to know what pressures were put on executives of these companies to violate the antitrust laws," Kefauver said last week. "We want to know if violation of the antitrust laws was, in fact, condoned by the companies. We want to know the present attitude of company officials toward the antitrust laws. We want to know if the conspiracies went higher up in the corporate hierarchy than the individuals indicted by the grand jury.

"As a result of our hearings, we hope enough new information will be uncovered so that the [Senate Antitrust and Monopoly] Subcommittee can decide in what manner to strengthen the antitrust laws to prevent such shocking conspiracies from ever occuring again," Kefauver said. This doesn't necessarily mean Kefauver has any specific legislative proposals in mind to strengthen the antitrust laws. But under Senate procedure, it is necessary for the subcommittee to have a legislative goal in order to conduct hearings.

Scheduled to appear before the subcommittee during the first two days of hearings on April 13 and 14 in Washington were 11 executives from General Electric Co, Westinghouse Electric Corp, Ingersoll-Rand Co, and Elliott Co. Generally, they are below the level of those indicted in Philadelphia and presumably testified before the investigating grand juries. During later hearings, Kefauver is expected to call witnesses higher up in the corporate echelons. (For news of opening session, see p 14.)

PRICE OF COPPER MAY BE GOING UP SOON

The price of copper may be heading up soon from its present 29¢/lb level. That's the consensus of reports from the market place. Although the recent upsurge in buying is discounted in some quarters because of the previous and protracted lull, talk of a price increase is growing from day to day. Custom smelters, especially, are finding themselves in a position where a price rise could be justified, because copper scrap is going up in price as it becomes more scarce, putting the custom smelters in a cost-price squeeze. And if they were to take the lead in raising prices, copper producers would probably follow. For the immediate future, though, the smelters will wait to make sure the market is firm enough to take an increase.

BUYERS STUDY IDENTICAL BIDS ON WATTHOUR METERS, ACSR CABLE

The city of Cleveland has invited five suppliers of watthour meters to meet with the city law director and explain why they submitted identical bids of $68,691 for 4,060 meters. The companies are General Electric Co, Westinghouse Electric Corp, Sangamo Electric Co, Duncan Electric Co, and Allen Electric Co. Presumably, the explanation the companies will state is that their bids were in accordance with their existing published price schedules. If this doesn't satisfy city officials, the suppliers may be asked to submit new bids.

In Washington, government officials are mulling over identical bids received recently on ACSR cable for Glen Canyon Dam in Arizona and the Central Valley project in California. The Bureau of Reclamation says it is checking to see: (1) Whether to reject the bids, (2) What reason there is for the bids being identical, and (3) How awards could be made, if the bids were accepted.

In the meantime, the facts on the Reclamation bids have been submitted to the Justice Department for legal review. Reclamation may make its decision on the awards without waiting for Justice's final word; but they're pretty certain to get a preliminary comment first from Justice.

Finally, in Philadelphia, a federal grand jury will soon start taking testimony in an investigation of the ACSR cable field. The Justice Department has had this probe in mind for almost two years now, but just never got around to it.

A. R. Waehner, Director of Transformer Product Sales, presents the story of L-M 32-step Regulators. Ask your L-M Field Engineer to show you why L-M Regulators are a better buy—how less weight permits cluster-mounting; how Round-Wound construction assures lower losses, higher short-circuit strength, how the design provides many other advantages in convenience, operation, reliability.

Ask Your L-M Field Engineer WHY L-M Regulators Are A Better BUY

Round-Wound® design provides better cooling, lighter weight for cluster-mounting, higher short-circuit strength. Voltage and band width adjustments are accurately made in minutes.

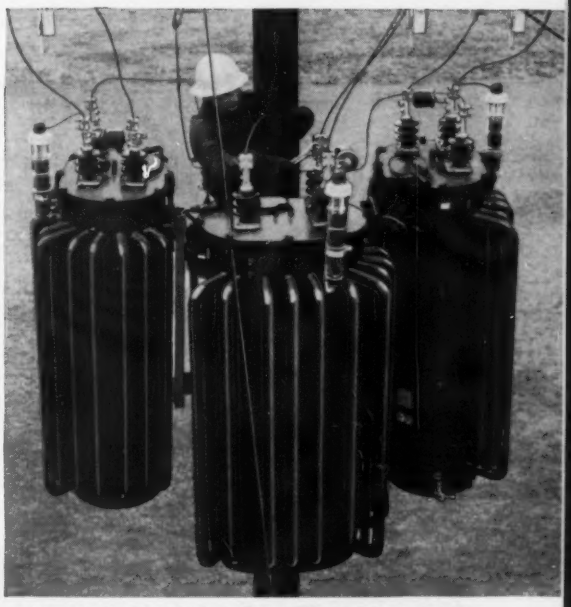
Only L-M's 32-step voltage regulators incorporate the Round-Wound principle of core-and-coil design. Round-Wound design provides faster heat transfer for better cooling.

More Compact—77% Lighter—Round-Wound core-and-coil assemblies are more compact. L-M regulators have shorter obround tanks requiring less oil. Up to 77% less weight permits cluster-mounting.

Higher Short-Circuit Strength—L-M's exclusive round coils withstand mechanical stresses of short-circuit currents better than other designs.

Rugged, Reliable—Only L-M regulators have the exclusive induction disc watt-hour type contact-making voltmeter. Control is more accurate, reliable and rugged. Calibration is easier with no interruption in service.

Get The Whole Story—Your L-M Field Engineer has the complete story on L-M's 32-step voltage regulators. Contact him today or write Line Material Industries, P.O. Box 510, Zanesville, Ohio.



5000 KVA OF LOAD REGULATED FROM A SINGLE POLE! Here three L-M 219 ampere, 7620 volt regulators are cluster-mounted to provide regulation on a 7620/13200 volt multi-grounded wye distribution feeder.

OUR 50TH YEAR 1911 – 1961

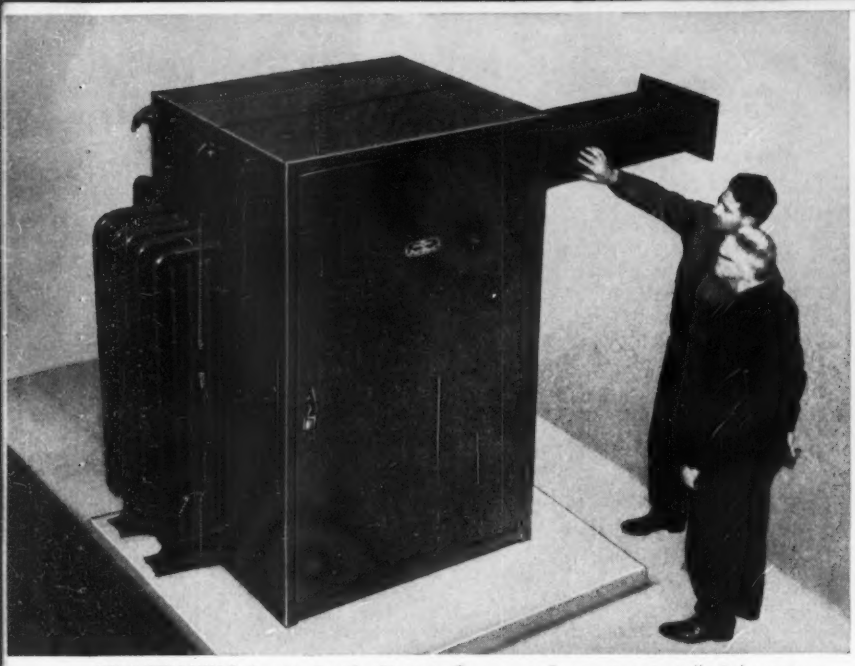
LINE MATERIAL®
Industries
McGRAW-EDISON COMPANY

McGRAW EDISON

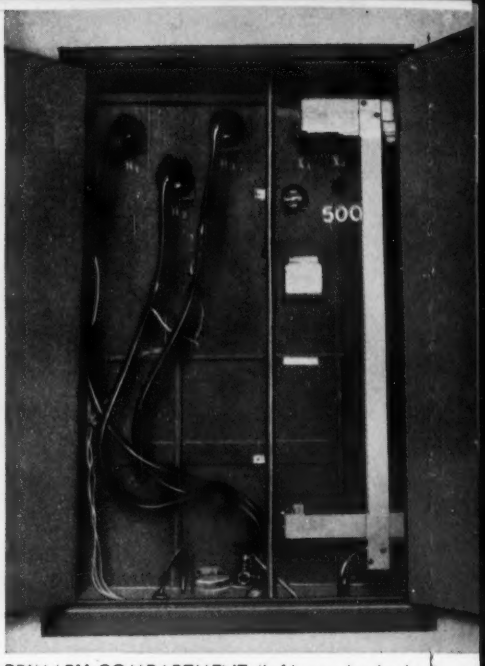
511

Regulators

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE & CONDUIT



KENNETH HILLS (back), Pacific Electric Company, Bremerton, installed the unique bus and duct, which he is showing to L. E. Hill, Asst. Supt., Western Division, Puget Sound Power & Light Company. The power company installed the L-M Pad-Mount transformer. Coast Electric & Manufacturing Co. made the bus and duct.



PRIMARY COMPARTMENT (left) can be locked and still permit access to secondary compartment, right. Short 4-foot bus connected to switch panel cuts secondary voltage drop.

NEW WESTBAY SHOPPING CENTER, Port Orchard, Washington. Power service is led underground to the Pad-Mount transformer from the pole at the right, which carries fuse cutouts and lightning arresters. Alexander H. Hargis designed the underground system and engineered the entire shopping center.

L-M's Pad-Mount® Transformer Maintains Voltage For West Coast Shopping Center

Unique design provides short 4-foot bus to switch panel, maintenance-free duct connection at Port Orchard, Washington shopping center.

Secondary voltage drop in incoming service is reduced by unique bus design in the L-M Pad-Mount transformer installation at Westbay Shopping Center, Port Orchard, Wash.

Separate primary and secondary cabinets in the Pad-Mount transformer simplify installation and provide flexibility for future transformer changes. Tamper-proof construction with no accessibility to live parts assures maximum safety for shoppers and children. The compact design and neat appearance make the transformer unobtrusive.

Installation Data

Primary

Type of circuit . . . . . radial
Pad-Mount transformer rating, 12470Y/7200 volts, 500 kva

Secondary

Type of circuit . . . . . four-wire
Voltage, volts 208Y/120
Type of load . . . . . commercial

OUR 50TH YEAR 1911 — 1961

LINE MATERIAL® Industries

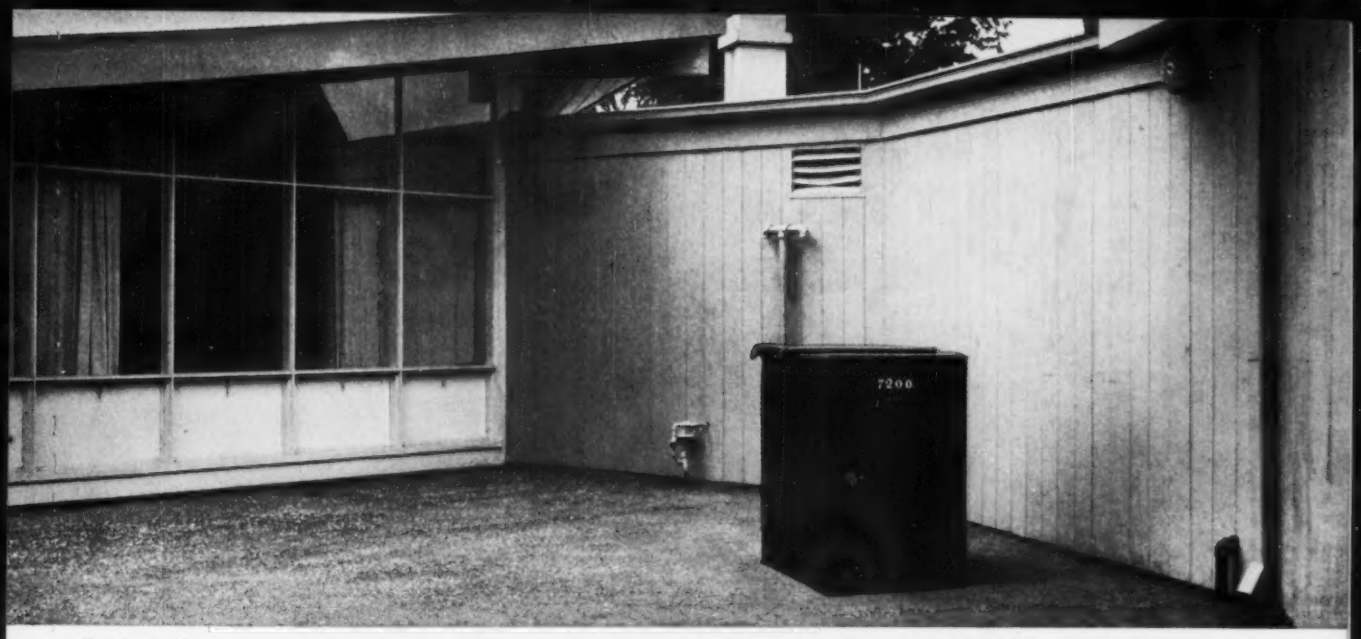
McGRAW-EDISON COMPANY

503

Transformers

McGRAW EDISON

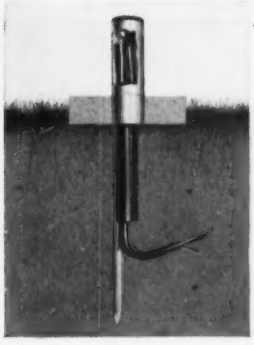
DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE & CONDUIT



This is the *first* pad-mounted transformer installed anywhere in the United States by anyone. It is L-M's Pad-Mount®, Serial No. 1763851, shipped on March 17, 1958 and energized in June of that year at the Blackhawk School in Roselle, Illinois.

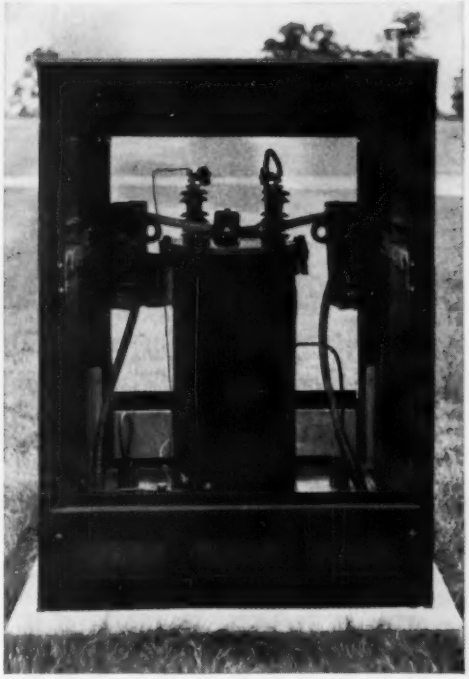
Modifications in this original design make the Pad-Mount the most convenient, practical, and economical transformer of this type. In all distribution voltages, in ratings through 167 kva single phase and 500 kva 3-phase.

Wide Choice Of L-M Equipment Designed To Cut Costs Of Underground Distribution



L-M Power Pedestal, an L-M development, provides rainproof, tamperproof facilities for above-ground connection of cables. Several types available.

L-M low-cost Fault Indicator will save many hours of labor and outage time by instantly and visibly indicating the faulted section of cable.



The L-M Transclosure provides a ventilated, weatherproof, tamperproof housing for pole-type transformers, protective equipment, switches, etc. A convenient, economical bridge between overhead and conventional underground. May be ganged if desired. No de-rating of transformers. Note installation of Cable Fault Indicator.

Ask The L-M Field Engineer For Information

As the leader in designing equipment for underground distribution, L-M can provide a wide variety of experience on systems and apparatus. Ask the L-M Field Engineer for Application Bulletins, Test Data, and Product Information; or write Line Material Industries, Milwaukee 1, Wisconsin.

499

LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

Underground Distribution Equipment

McGRAW EDISON

DISTRIBUTION TRANSFORMERS · RECLOSERS, SECTIONALIZERS AND OIL SWITCHES · FUSE CUTOUTS AND FUSE LINKS · LIGHTNING ARRESTERS · POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS · CAPACITORS · REGULATORS · OUTDOOR LIGHTING · LINE CONSTRUCTION MATERIALS · PORCELAIN INSULATORS · FIBRE PIPE & CONDUIT

BROADER WARRANTY
GREATER ECONOMY AND DURABILITY
'61 FORD TRUCKS

The new extended warranty for all 1961 Ford Trucks is just one example of the many ways Ford gives you maximum protection for your truck investment. Each part, except tires and tubes, is now warranted by your dealer against defects in material or workmanship for 12 months or 12,000 miles, whichever comes first. Warranty does not apply, of course, to normal maintenance service or to the replacement as normal maintenance of such items as filters, spark plugs and ignition points.

The excellent fuel economy of Ford's modern 223-cu. in. Six has been proved in certified tests by independent experts over a 3-year span. Front tires on Ford conventional ½-tonners also lasted up to twice as long as those on other makes with independent suspension.

In addition to price, fuel and tire savings, 1961 Ford Trucks provide greater freedom from nuisance problems that crop up with other trucks. Ford's rigid quality controls give you the strongest safeguard of truck reliability ever. Fords stay on the job . . . out of the shop!

F-100 Chassis-Cab models have new stronger frame for greater durability and longer wheelbase for smoother ride. 28% more glass area in cab gives you new wide-angle view to front, sides and rear.

New Econoline Van . . . modern cab-forward design gives as much as 57 more cubic feet of cargo space in nearly three feet less length than conventional half-ton panels. It's America's lowest-priced* van and can cut yearly operating costs by $100 or more.

New 4-wheel drive pickups . . . priced to save you plenty, Ford's 4 x 4's come in ½- and ¾-ton capacities. They're tougher than ever with stronger frame, improved suspension and new optional heavy-duty front axle on ¾-tonners.

*Based on a comparison of latest available manufacturers' suggested retail prices

ALL-NEW
FORD "BIG SIX"
262-cu. in. engine

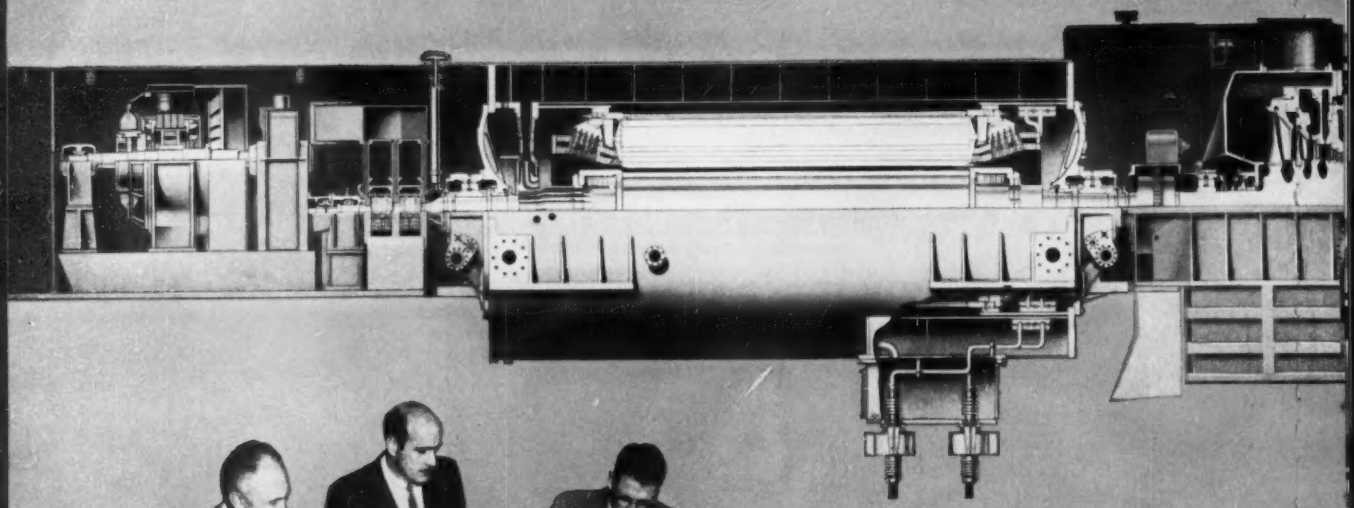
Now, the rugged simplicity of a big 262-cubic-inch Six combined with the dependability of heavy-duty, exclusive-truck engine design. It's yours in America's toughest two-tonners from Ford!

In a grueling 40,000-mile test of reliability, Ford's new Big Six was pitted against its principal competitor in the 2-ton field. Result: Ford's new engine required far fewer service adjustments. This means you can expect less time in the shop . . . more time on the job.

FORD TRUCKS COST LESS

SEE YOUR FORD DEALER'S "CERTIFIED ECONOMY BOOK" FOR PROOF!

FORD DIVISION, Ford Motor Company.

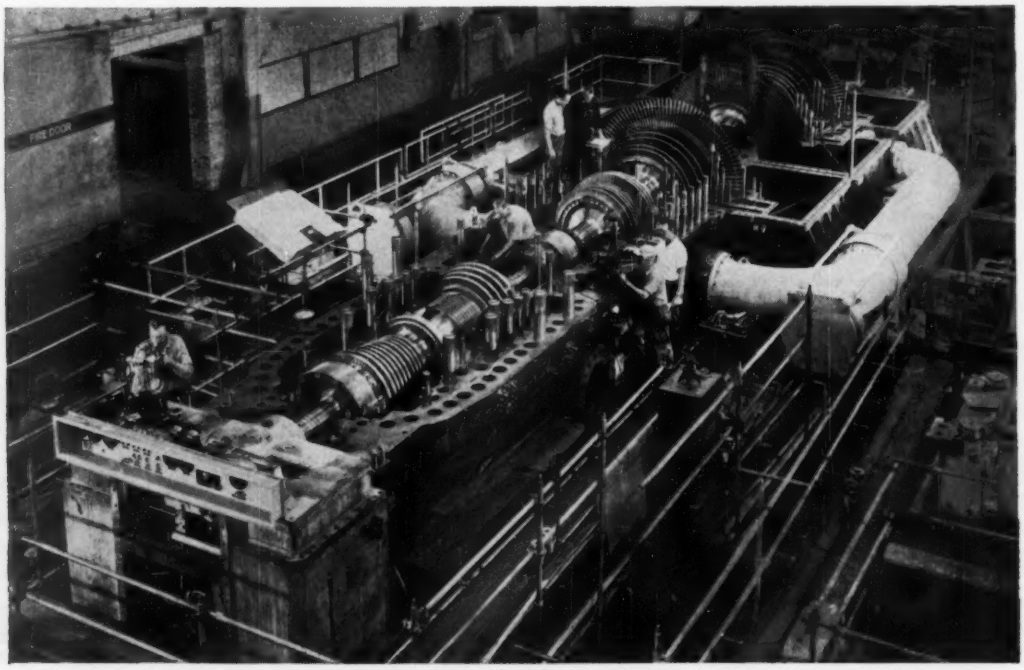


Design Firsts by Allis-Chalmers

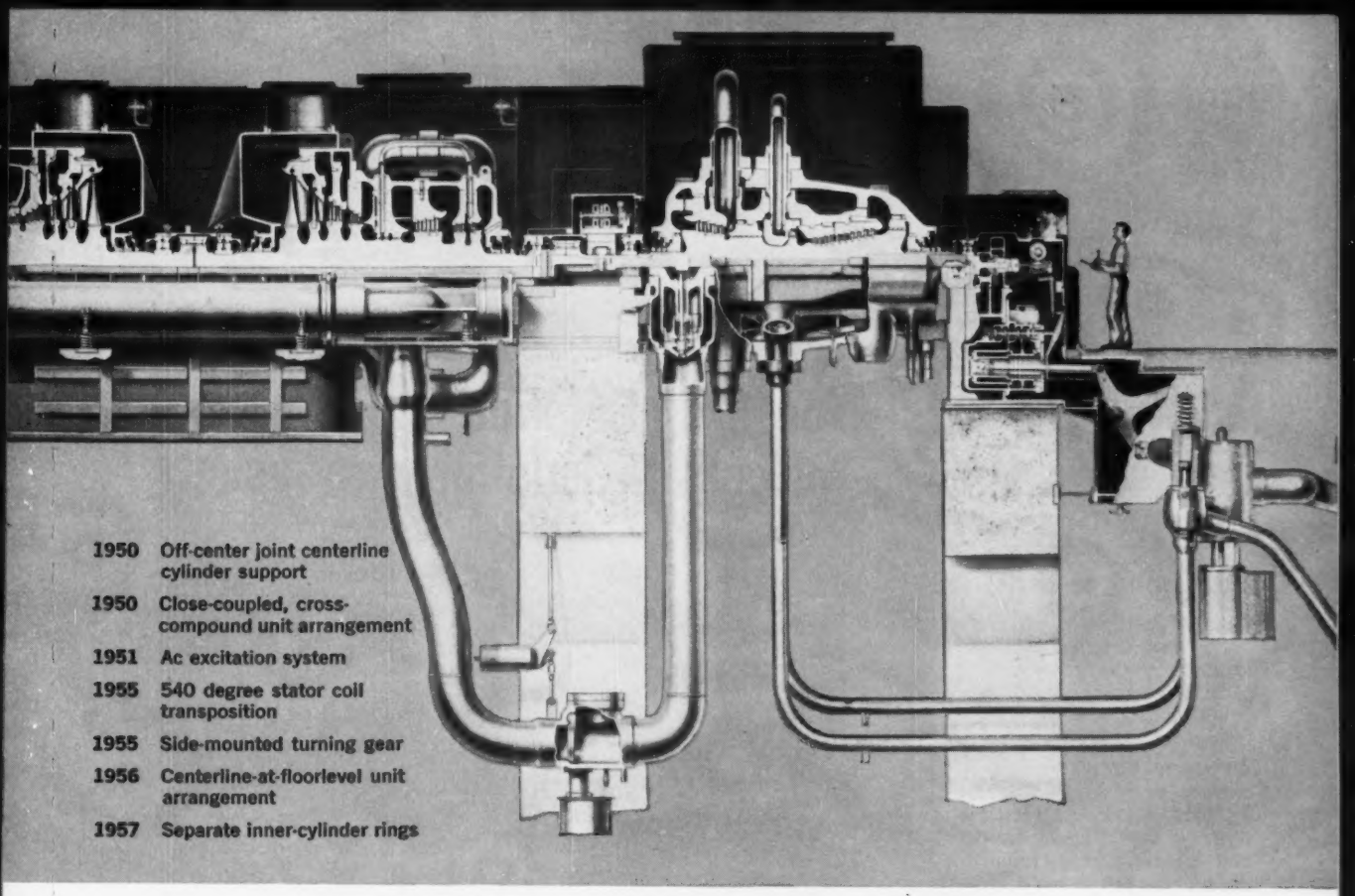
1926	Side-crossunders
1934	Separate nozzle chests
1936	Thrust-type hydrogen seals
1941	Nonsliding thrust-bearing pedestals
1948	Supercharged axial ventilation

Designing today for tomorrow's power needs, Allis-Chalmers experienced, forward-thinking engineering staff has pioneered higher ratings and unique arrangements for steam turbine-generator units . . . originated and patented many of the design features now adopted as industry standards for such equipment.

PACING



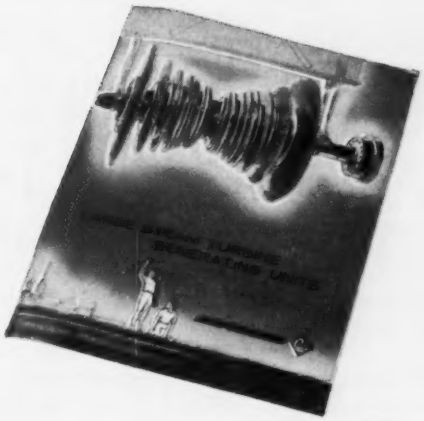
Engineering know-how and the results of extensive research and development programs are confirmed on the large turbine test pits. During the past few years A-C has spent millions of dollars expanding and modernizing manufacturing facilities like these to assure that design excellence created on the drawing board is translated into the finished product.


1950 Off-center joint centerline cylinder support
1950 Close-coupled, cross-compound unit arrangement
1951 Ac excitation system
1955 540 degree stator coil transposition
1955 Side-mounted turning gear
1956 Centerline-at-floorlevel unit arrangement
1957 Separate inner-cylinder rings

POWER PROGRESS ...by design!

An Allis-Chalmers tandem triple-flow steam turbine-generator unit, for example, incorporates such industry-recognized A-C developments as . . . centerline-supported inner and outer high-temperature cylinders; thrust-balanced turbine elements with high-temperature steam confined to a single shaft of small diameter; separate below-floor front-mounted steam chest; and separate ring-type nozzle chest in a center-inlet high-pressure turbine. Also, hydrostatic thrust-bearing-type shaft seals for the fully supercharged generator.

These advanced design concepts add to Allis-Chalmers growing list of firsts — set new industry standards for performance and continue the pattern by which A-C paces power progress . . . ahead of utility requirements.



NEW BULLETIN

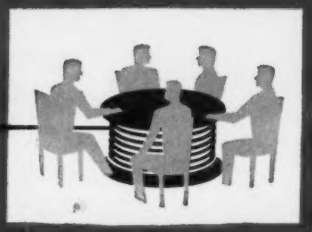
For more information on these and other outstanding design features of Allis-Chalmers line of reheat steam turbine-generator units, contact your nearest A-C office for Bulletin 03B9448. Forty pages, illustrated by more than 100 photographs, tell how A-C is pacing power progress.

ALLIS-CHALMERS

A-1212

DU PONT

WIRE AND CABLE ROUND TABLE



Over 20 years' exposure in Florida sun proves weather resistance of polyethylene for wire jackets

You have asked . . .

Q. Our test results on the dielectric constant and dissipation factor of your ALATHON polyethylene resins do not correlate with your published data. Can you resolve these differences?

A. Possibly our different values are due to a variance in test methods. We normally test the dielectric constant and dissipation factor of ALATHON resins by the benzene cell in our laboratories. Another reliable test uses the guarded-cell method. However, the guarded-cell method consistently gives higher dielectric constant values and slightly lower dissipation factors than the benzene cell. While both methods are ASTM-approved, we prefer the benzene cell despite some of the precautions required in handling benzene.

As an example, we tested five lots of weatherable ALATHON 4, BK-30 by both test methods. Following are the average dielectric constant and dissipation factor results at 10Kc. Please note that the values are for a carbon-filled polyethylene. A natural polyethylene would have superior electrical properties.

	Guarded Cell	Benzene Cell
Dielectric Constant	2.70	2.58
Dissipation Factor	0.0009	0.0012

Du Pont does not manufacture wire and cable, but supplies thermoplastic resins to the wire and cable industry.

(UNRETOUCHED PHOTO)

The segment of telephone wire being flexed in the photograph above is part of a Bell Telephone Laboratories test installation which has been exposed for over twenty years to Florida sunlight and weather. The wire, which was jacketed with a weather-resistant polyethylene resin, withstood this prolonged exposure with no significant adverse effect.

Newer formulations of Du Pont ALATHON polyethylene resins have shown over fifty years' weather resistance in accelerated tests. Today, high-molecular-weight polyethylene is the preferred jacketing material of many large utilities and industrial users.

Whether environmental conditions include intense sunlight or repeated exposure to ice and storm, jacketing of ALATHON provides the necessary weather resistance, stress crack resistance and abrasion resistance. Installation is easier, too—because cable jacketed with ALATHON is light, flexible and smooth. It offers you minimum maintenance, maximum service dependability.

For more information about the properties and advantages of wire and cable constructions with insulation and jacketing of ALATHON polyethylene resins, consult your supplier. Or write: Du Pont Company, Dept. EW-417, Room 2507A, Nemours Building, Wilmington 98, Delaware.

• • •

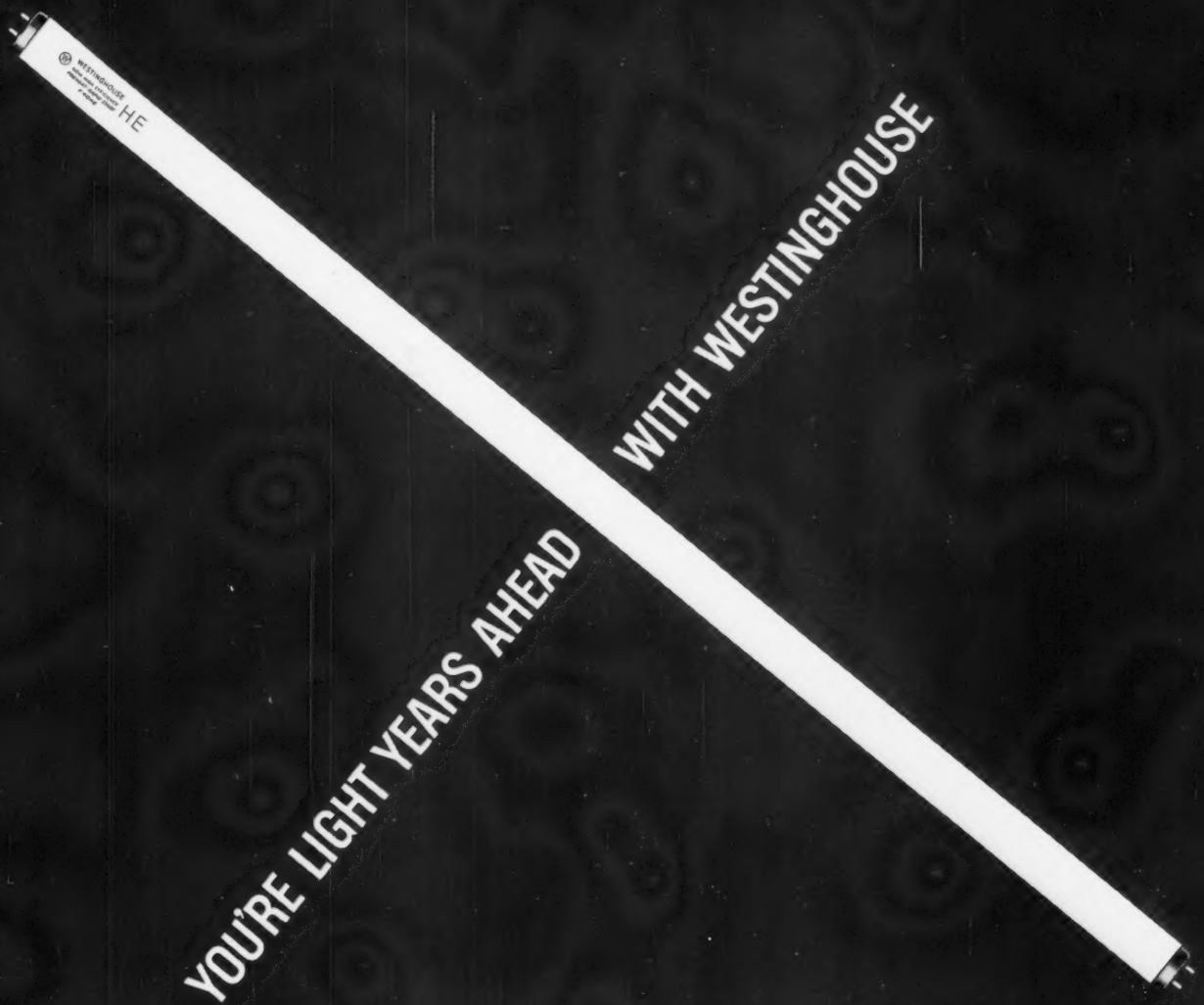
In Canada: Du Pont of Canada Limited, P.O. Box 660, Montreal, Quebec.

POLYCHEMICALS DEPARTMENT

DU PONT
REG. U.S. PAT. OFF.

Better Things for Better Living . . . through Chemistry

ALATHON® POLYETHYLENE RESINS | **RULAN®** FLAME-RETARDANT PLASTICS | **ZYTEL®** NYLON RESINS



NEW WESTINGHOUSE HIGH-EFFICIENCY LAMPS GIVE YOU ⅓ MORE LIGHT AT NO EXTRA COST AND YOU DON'T HAVE TO CHANGE FIXTURES!

Now you can increase lighting levels without changing a single fixture . . . without increasing power costs . . . and without paying premium lamp prices. New Westinghouse "High Efficiency" fluorescent lamps give you a full third more light than daylight lamps . . . and 15% more light than cool white lamps . . . without consuming an extra watt of power!

"H.E." lamps are so new even the color tint is different—and only Westinghouse has it! A special blend of phosphor particles coating the inside of each lamp provides the higher lumen output . . . with a pleasant and restful green tint. Users everywhere feel this new green-white light gives a softer, more comfortable light . . . the most efficient working light yet. Try "H.E." lamps in an entire area. If you don't agree that they provide the most efficient light ever, we will gladly exchange them for any Westinghouse fluorescent, any color shade, of your choice!

With "H.E." and other Westinghouse lamps, the Westinghouse Lighting Cost Reduction Plan gives you one or more of these benefits:

1. **Reduced cost of lamp purchases!**
2. **Reduced lamp replacement labor costs!**
3. **Increased lighting level for the same or lower costs!**
4. **More efficient use of power!**

Order new Westinghouse "H.E." lamps today and get more information on the Lighting Cost Reduction Plan from your authorized Westinghouse Lamp Agent or your nearest Westinghouse Lamp Sales Office! ***You can be sure...if it's Westinghouse.***

Westinghouse

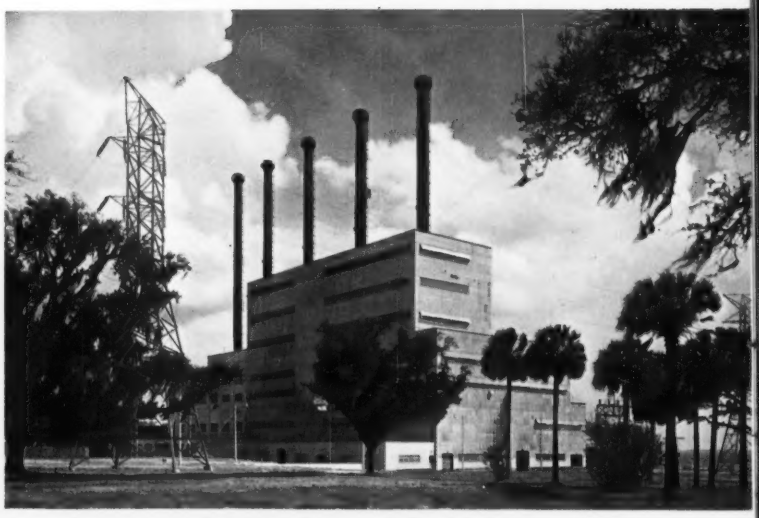
Westinghouse Lamp Division, Westinghouse Electric Corporation, Bloomfield 2, N.J.

FLORIDA POWER CORPORATION'S
TURNER STATION
Enterprise, Florida

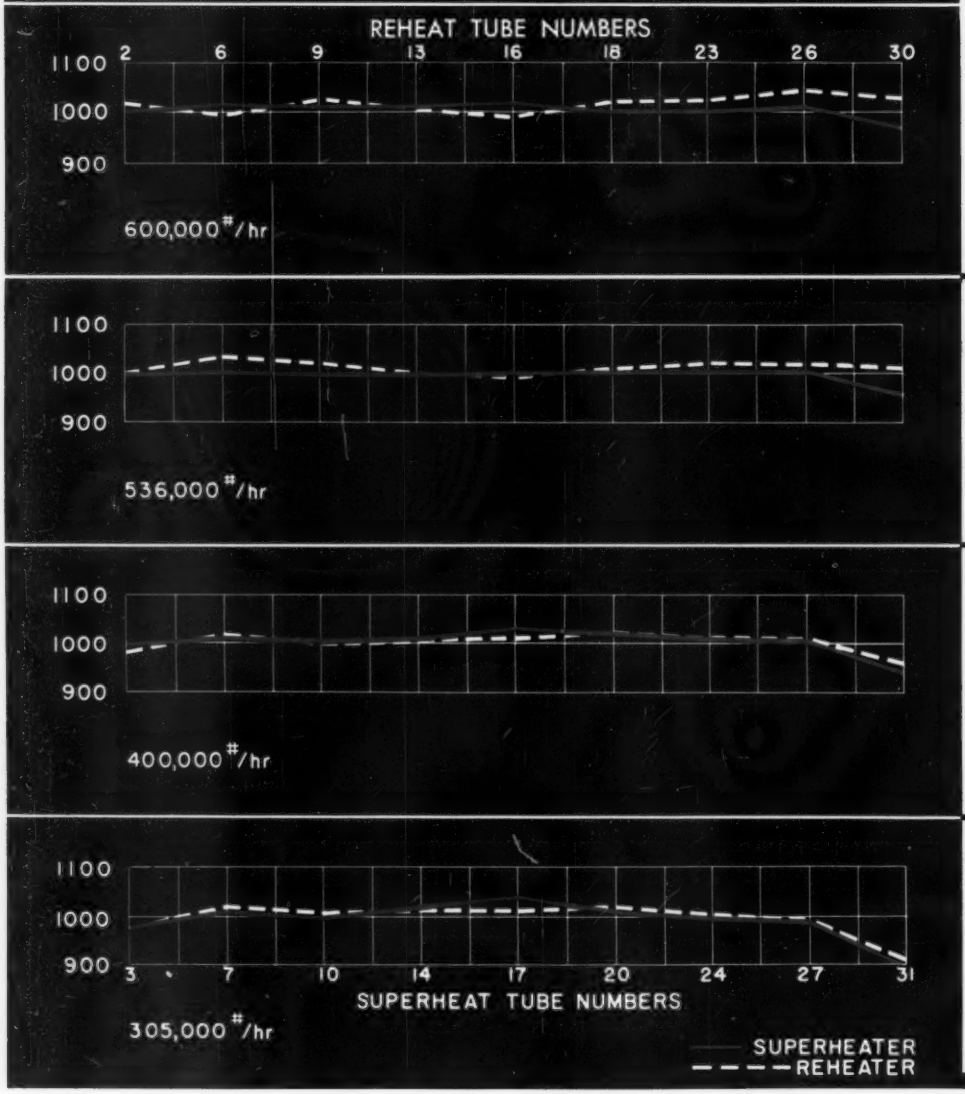
Unit No. 4 is a 600/000 lb/hr
RILEY TURBO FURNACE BOILER

Design Pressure — 1750 psig
Superheat/Reheat — 1000° F
Fired by Natural Gas and Oil
Efficiency up to 90% on oil — 86% on gas.

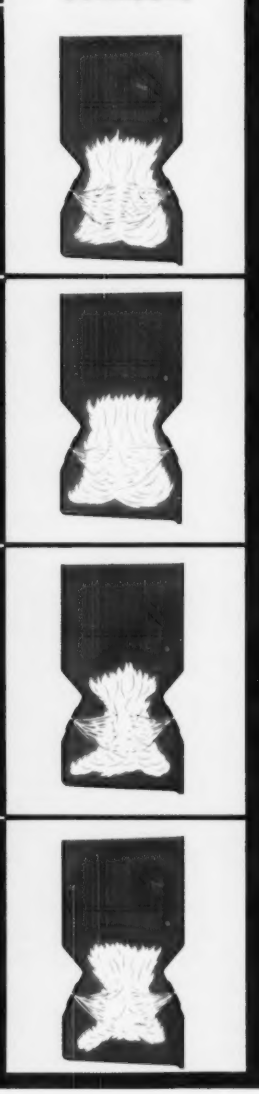
BLACK & VEATCH
Consulting Engineers



FINAL SUPERHEAT-REHEAT EXIT TUBE TEMPERATURES



FLAME CONTOURS

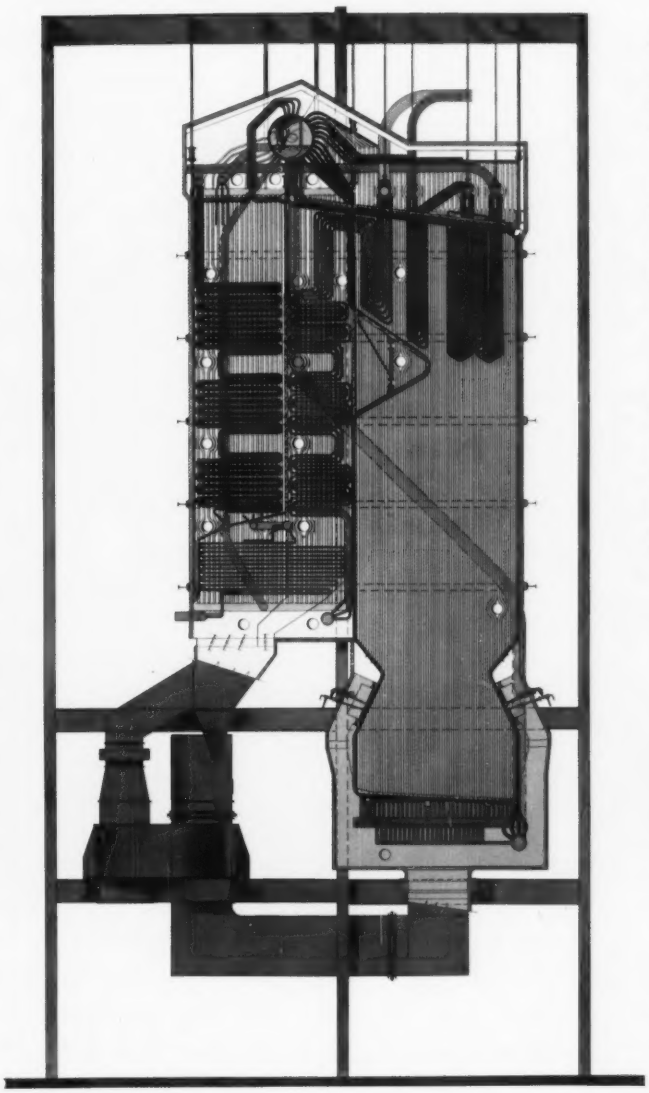


RILEY TURBO FURNACE

produces extremely uniform furnace exit temperature at

FLORIDA POWER CORPORATION

Uniform, safe gas temperatures across the full span of a boiler's high temperature superheater and reheater is a vital requirement for trouble-free operation. With a Riley Turbo Furnace this objective is attained . . . without use of costly auxiliary methods for distributing furnace gas.



In the Riley Turbo Furnace all fuels — gas, oil, coal — are burned at the base of the furnace well away from superheater and reheater with combustion taking place evenly from side wall to side wall. Combustion gas rises within the furnace envelope in a uniform side wall to side wall column resulting in minimum variation in metal skin temperatures of all superheater and reheater elements. Temperatures are well within safe alloy limits to assure long tube life. Proof of such performance is provided in the accompanying curves. Flame contour diagrams illustrate combustion uniformity at each load level.

The Turbo Furnace boiler is capable of operating over a 6-1 load range with oil or gas firing with all burners in service on automatic control and without burner adjustment. Design and operating characteristics of the Turbo Furnace also provide more rapid and uniform water and steam circulation, help to maintain a clean furnace, and minimize flyash and air pollution problems.

RILEY

STEAM GENERATING AND
FUEL BURNING EQUIPMENT

RILEY STOKER CORPORATION
WORCESTER, MASSACHUSETTS

SALES OFFICES:
Boston, Charlotte, Chicago, Cincinnati, Cleveland, Denver, Detroit, Honolulu, Houston, Jacksonville, Kansas City, Los Angeles, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Salt Lake City, San Francisco, St. Louis, St. Paul, Seattle, Syracuse.

ONLY CRESCENT OFFERS THIS COMPLETE LINE!
Crescent—2 sizes. 15" and 18". Black finish.
Crescent—5 sizes. 4" to 12". Black finish.
Crestolock—3 sizes. 8", 10" and 12". Chrome finish.
Crestoloy—3 sizes. 15", 18" and 24". Chrome finish.
Crestoloy—5 sizes. 4" to 12". Chrome finish.
Crestoloy—4 sizes. 4-6" to 10-12". Chrome finish.

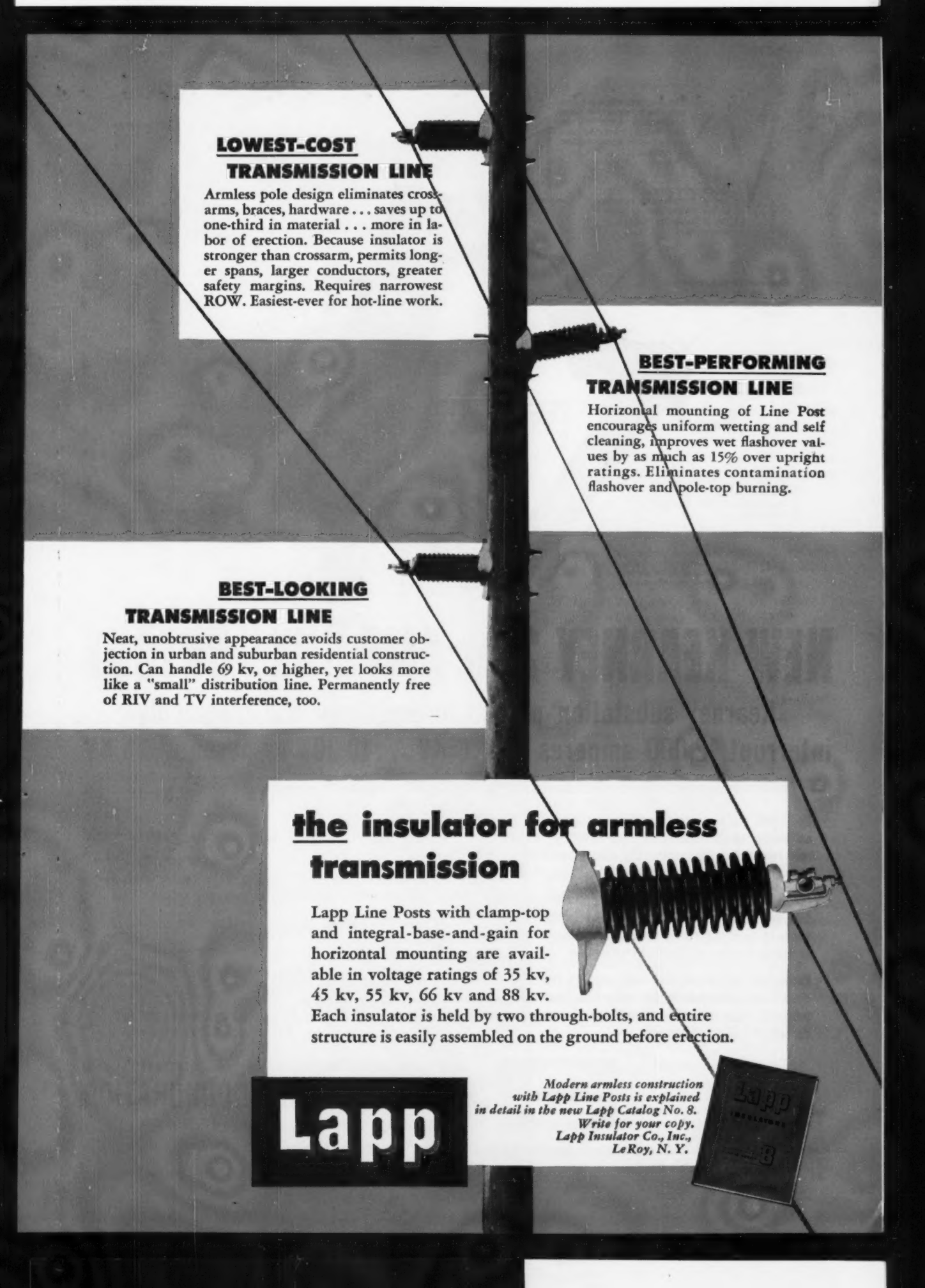
NONE BETTER ANYWHERE!

CRESCENT and CRESTOLOY Wrenches are made by the originators of the 22½° adjustable wrench. They have been widely copied but never equalled for design, balance, quality and all-around performance. The buyer who wants top value in tools insists on CRESCENT.

Sold by hardware dealers and industrial distributors everywhere.

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK



LOWEST-COST TRANSMISSION LINE

Armless pole design eliminates crossarms, braces, hardware . . . saves up to one-third in material . . . more in labor of erection. Because insulator is stronger than crossarm, permits longer spans, larger conductors, greater safety margins. Requires narrowest ROW. Easiest-ever for hot-line work.

BEST-PERFORMING TRANSMISSION LINE

Horizontal mounting of Line Post encourages uniform wetting and self cleaning, improves wet flashover values by as much as 15% over upright ratings. Eliminates contamination flashover and pole-top burning.

BEST-LOOKING TRANSMISSION LINE

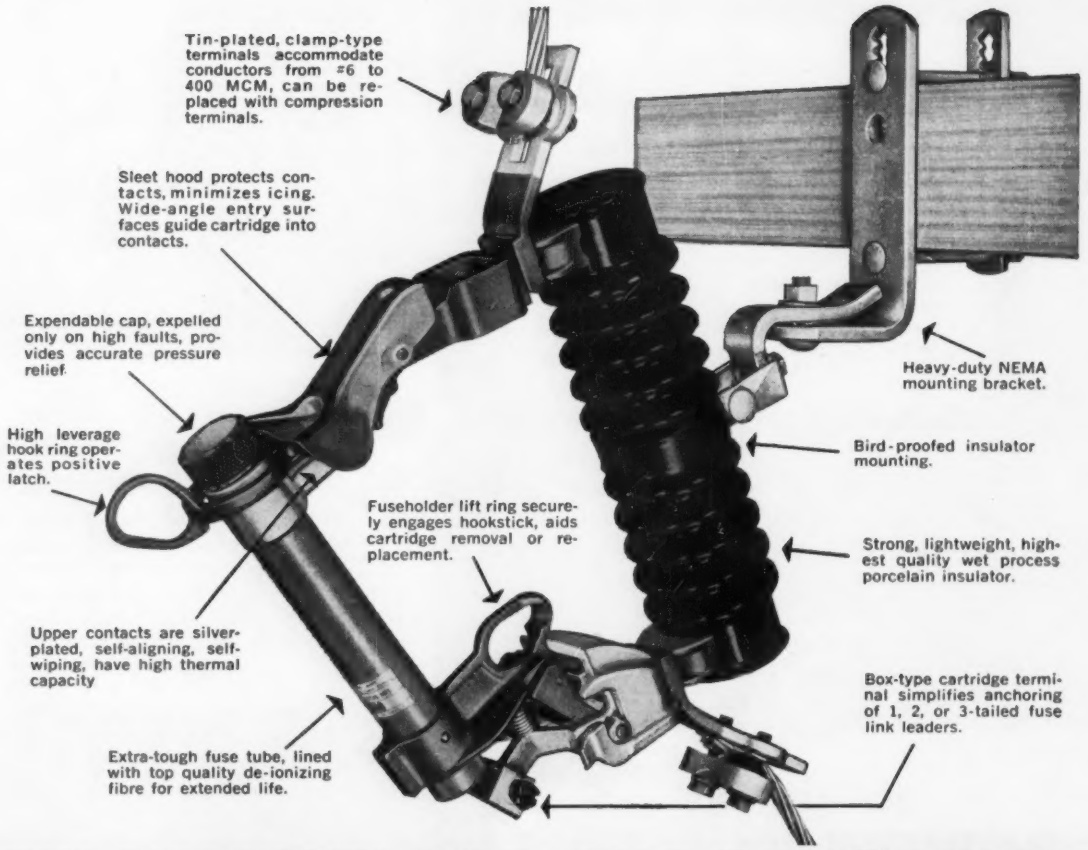
Neat, unobtrusive appearance avoids customer objection in urban and suburban residential construction. Can handle 69 kv, or higher, yet looks more like a "small" distribution line. Permanently free of RIV and TV interference, too.

the insulator for armless transmission

Lapp Line Posts with clamp-top and integral-base-and-gain for horizontal mounting are available in voltage ratings of 35 kv, 45 kv, 55 kv, 66 kv and 88 kv. Each insulator is held by two through-bolts, and entire structure is easily assembled on the ground before erection.

Lapp

Modern armless construction with Lapp Line Posts is explained in detail in the new Lapp Catalog No. 8. Write for your copy.
Lapp Insulator Co., Inc., LeRoy, N. Y.


Tin-plated, clamp-type terminals accommodate conductors from #6 to 400 MCM, can be replaced with compression terminals.
Sleet hood protects contacts, minimizes icing. Wide-angle entry surfaces guide cartridge into contacts.
Expendable cap, expelled only on high faults, provides accurate pressure relief.
High leverage hook ring operates positive latch.
Upper contacts are silver-plated, self-aligning, self-wiping, have high thermal capacity
Extra-tough fuse tube, lined with top quality de-ionizing fibre for extended life.
Fuseholder lift ring securely engages hookstick, aids cartridge removal or replacement.
Heavy-duty NEMA mounting bracket.
Bird-proofed insulator mounting.
Strong, lightweight, highest quality wet process porcelain insulator.
Box-type cartridge terminal simplifies anchoring of 1, 2, or 3-tailed fuse link leaders.

NEW KEARNEY 200 AMP "HX" CUTOUT

Kearney substation-proved to positively and repeatedly interrupt 12,000 amperes at 7.8 KV . . . 10,000 amperes at 15 KV

- No "blind" spots . . . a highly efficient combination of single end venting and expendable cap double venting insures dependable interruption throughout the entire fault range . . . from low current values to maximum rated capacity of the cutout.
- On low and medium faults, expendable cap remains intact . . . tube vents only at bottom. Controlled spring loading and long travel of lower hinge toggle whips fuse cable out of cartridge to insure positive low current interruption.
- Expendable cap is expelled only on high faults. Resultant double end expulsion in line with fuse tube relieves gas pressure, equalizes interruption shock forces and prevents damage to cutout or bracket.
- Switchstick-operated positive latch prevents accidental cartridge dropout due to vibration, impact, or magnetic forces.
- Strong, durable, non-ferrous construction for long life, optimum performance. All current-carrying parts copper alloy. Silver-plated contacts. Stainless steel pins and springs.
- Fuseholders accept all conventional button-type links.
- Kearney "HX" Fuse Cutouts are available on single insulator, NEMA station-post, or centerbolt insulator mountings; also in 100 ampere continuous ratings.

Ask your Kearney Sales Representative for full information or write for "HX" Cutout Bulletin

KEARNEY

for better construction . . . safer maintenance . . . specify KEARNEY products

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Missouri

PLANTS AT: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH, IOWA • CLARINDA, IOWA • GUELPH, ONTARIO, CANADA • ST. THERESE, QUEBEC, CANADA

5 KV ? 15 KV ?

HIGH-VOLTAGE CABLES—IN THE LENGTH YOU NEED—NOW AVAILABLE "OFF THE SHELF"

More and more contractors are being invited to bid on projects which include high-voltage cable.

Now *you* can go after this profitable business, because Rome has made it possible for you to:

1. Get the cable you need, *when* you need it, in the *length* you need.

2. Get cable of the *quality* the job requires. (In high-voltage work, "second best" cables can eat up your profits during call-back after call-back.)

Today you can order the length of high-voltage cable you need—ten feet or ten thousand—right "off the shelf," through Rome's new stockpiling program.

And you'll get the quality your customers expect—the same Rome cables that have earned their reputation the hard way: through miles upon miles of high-voltage jobs over the years.

Popular sizes 5 and 15 kv Rozone Roprene single-conductor cables are currently being stocked at Rome in the sizes most frequently needed.

This gives you a quick answer to a wide variety of cable problems. Rozone is a versatile, long-life insulation that resists ozone and moisture. Roprene is tough neoprene jacketing that resists weather, fire, oils, chemicals, heat and aging.

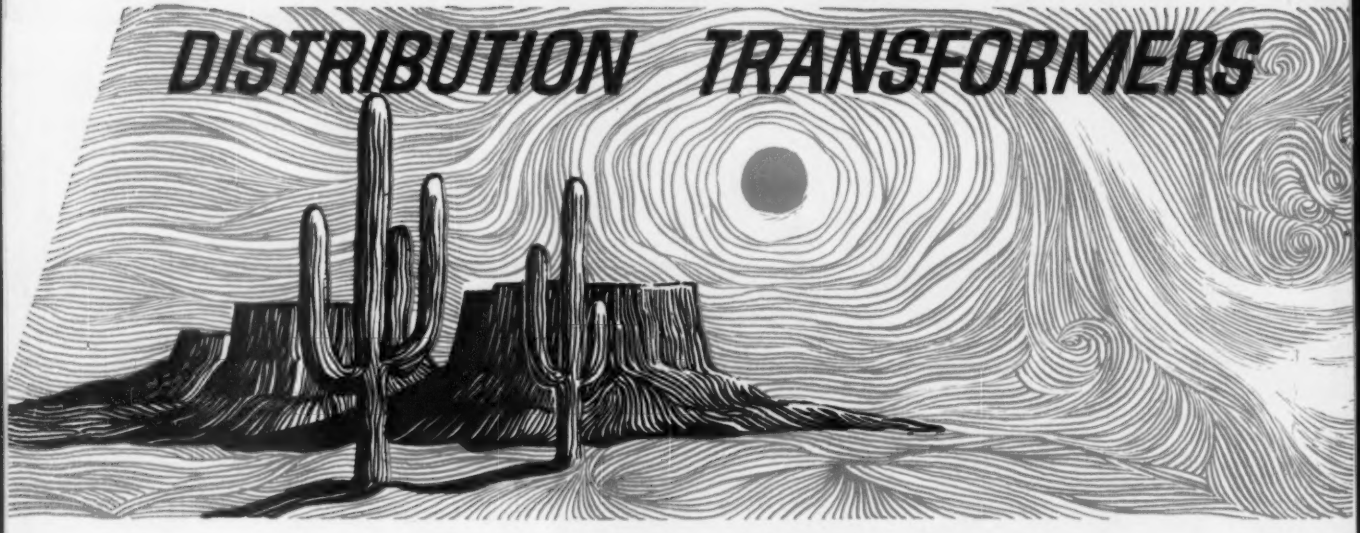
Start on your next job Your next bid may be on a school, commercial building, or industrial plant which requires high-voltage cable. Be ready for this business. Your Rome distributor is the man to call for 5 and 15 kv cable. Ask him about it this week.

Rome Cable Division of Alcoa, Dept. 1-41, Rome, N.Y.

ALCOA
ROME CABLE
DIVISION

ENDUR-

DISTRIBUTION TRANSFORMERS

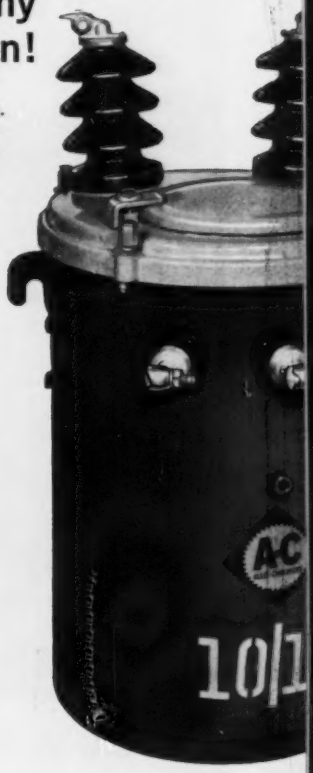


ALLIS-CHALMERS

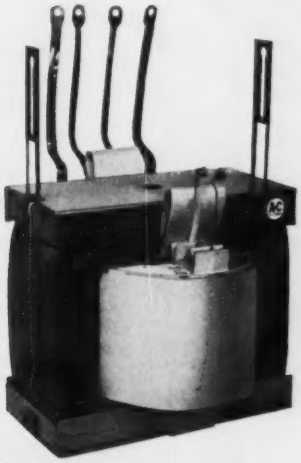
A-1460

New enduring values... more for your transformer dollar...yours with the all-new ENDUR-ALL line... guaranteed to perform far better than any previous design!

ENDUR-ALL transformers are available in conventional and self-protected types with such accessories as a low-voltage circuit breaker, high-voltage fuses and lightning arresters.



ALL



New locked core-and-coil construction eliminates 32 nuts, bolts and washers from this assembly. Nothing to loosen, no welds to break. Locking straps assure uniform high compression for greater short-circuit strength.

ENDURING VALUES IN OVERLOAD CAPABILITIES

new high-temperature oil . . . new high-temperature insulation . . . greater oil duct area in the coil.

ENDURING VALUES IN INCREASED REVENUE

new design reduces impedance by as much as 25% — permits full utilization of the greater overload capacity.

ENDURING VALUES IN SHORT-CIRCUIT STRENGTH

new *locked* core-and-coil construction assures uniform high pressure clamping of the coil for the life of the unit.

ENDURING VALUES IN EASIER HANDLING

new ENDUR-ALL line is *10% lighter, 10% lower* for easier hanging.

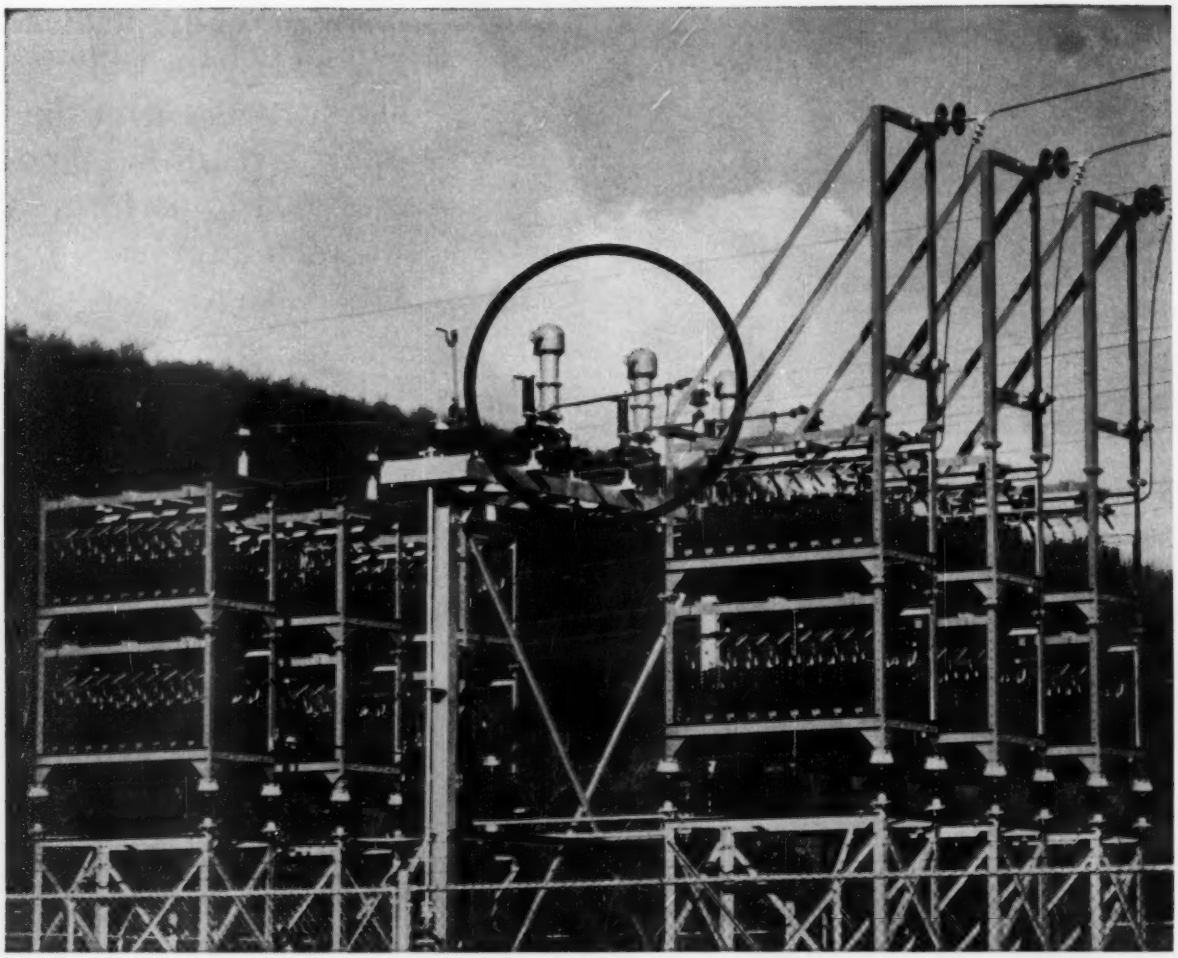
ENDURING VALUES IN REDUCED MAINTENANCE

new high-gloss-retention paint . . . nonaging, reusable gasketing... plus elimination of all nuts and bolts from end frame construction. No welds to break — nothing to loosen or shake free.

. . . AND ALL THESE ENDUR-ALL DESIGN ADVANTAGES:

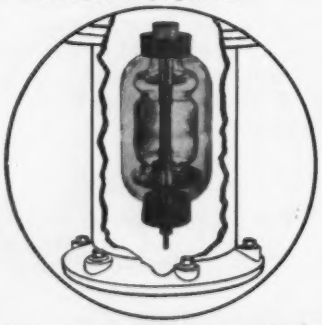
- 65 C rise with high overload capabilities
- Reduced maintenance with internally clamped bushings
- *Tuffilm* plastic-coated cover protects from animal and bird outages
- Series-multiple switch lowers changeover cost when making distribution voltage conversion. Write, phone or wire your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Tuffilm and ENDUR-ALL are Allis-Chalmers trademarks.



VACUUM SWITCHES PICKED BY PENELEC TO SWITCH HIGH VOLTAGE BANK-TO-BANK CAPACITORS

The switchgear controlling these capacitors are new Hi Voltage-Joslyn 34.5 kv Heavy Duty Vac-Rupter® switches utilizing Jennings vacuum power switches as the interrupting element.



Jennings type R9G vacuum power switch for 34.5 kv load break duty. 250 amp rated thermal currrent. Maximum fault interruption rating is 2000 amps rms.

Alert to the consumers' need for steady, uninterrupted electrical service, PENELEC chose vacuum switches to switch these two 5400 KVAR, 23 kv capacitor banks. Jennings vacuum switches are ideally suited to this type of service because they interrupt capacitive loads at the first current zero and recover dielectric strength fast enough that no restrikes occur. These characteristics are inherent in vacuum switches because of the very fast deionization of the contact gap during and immediately after interruption. Vacuum contacts in this type of service require no maintenance over an operating life of ten years or more.

This particular installation is only one of hundreds of successful power installations using Jennings vacuum switches since Jennings pioneered their use over six years ago. And behind that first commercial power application in 1955 was seven years of research, development, and the experience gleaned from hundreds of lighter duty industrial vacuum switch applications in constant use in the field.

Jennings vacuum switches have proven equally as effective in load break switching, transformer magnetizing current and inductive switching, fault current interruption, and high voltage transmission line dropping.

Our distribution of vacuum switches is through switchgear manufacturers who design and build complete switchgear equipment utilizing Jennings vacuum switches.

More detailed information on our 10 sizes of power switches is available on request

RELIABILITY MEANS VACUUM / ***VACUUM*** *MEANS* **Jennings®**

JENNINGS RADIO MFG. CORP., 970 McLAUGHLIN AVE., SAN JOSE 8, CALIF., PHONE CYpress 2-4025

TERESSO® TURBINE OILS GIVE YOU TRIPLE PROTECTION!

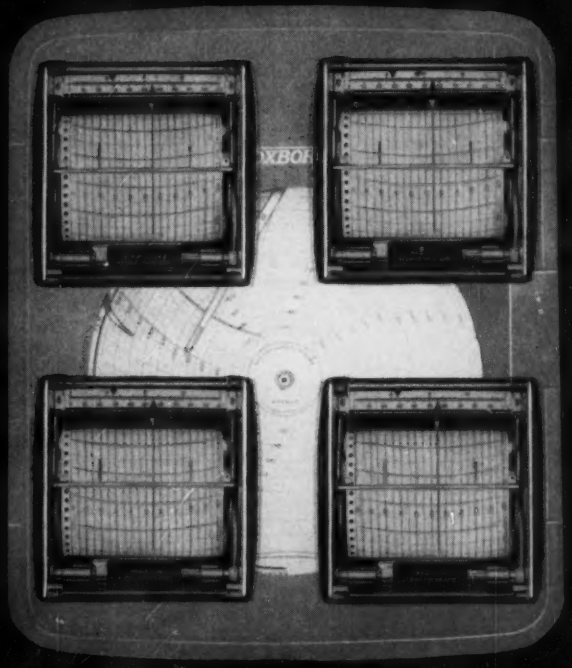
Premium-quality Teresso turbine oils are triple-inhibited for protection against rust, foaming, and the formation of harmful sludges. Their high viscosity index minimizes the natural tendency of oils to thin out at high temperatures and to thicken at low temperatures. Entrained water separates readily from Teresso turbine oils.

Teresso has long enjoyed a top position in the lubrication of turbines and other precision machinery. It is manufactured from fine paraffinic-base stocks selected for exceptional oxidation resistance. Advanced refining methods and special additives further its long service life.

UNIVOLT® oils for transformers offer excellent dielectric strength and low power factor. Their high-temperature stability is especially valuable during peak load periods. Your Esso Representative can help safeguard your dependable service. Give him a call, or write to us at 15 West 51st Street, New York 19, New York.

ESSO STANDARD, DIVISION OF
HUMBLE OIL & REFINING COMPANY

SAVE 75% OF YOUR PANEL SPACE without SACRIFICE OF FULL-SCALE RECORDS!



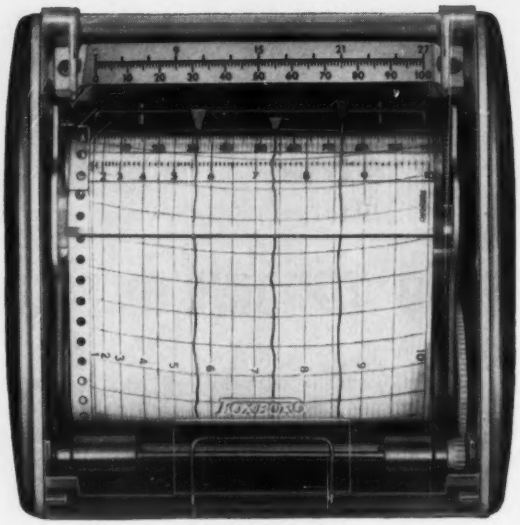
Foxboro CONSOTROL* Recorders

Yes, you can actually mount up to 4 Foxboro Consotrol Recorders in the panel space ordinarily required for one conventional-size instrument — and get a full-scale, 4"-wide chart record from each one! Or, using 3-pen Consotrol Recorders, get a total of 12 full-size records in the same panel space!

This unique combination of compactness and high readability is in *addition* to the outstanding convenience Consotrol Recorders provide. They're by far the simplest to maintain . . . inking only once every 6 months; chart replacement every 30 days. And the chart loads quicker and easier than a box camera!

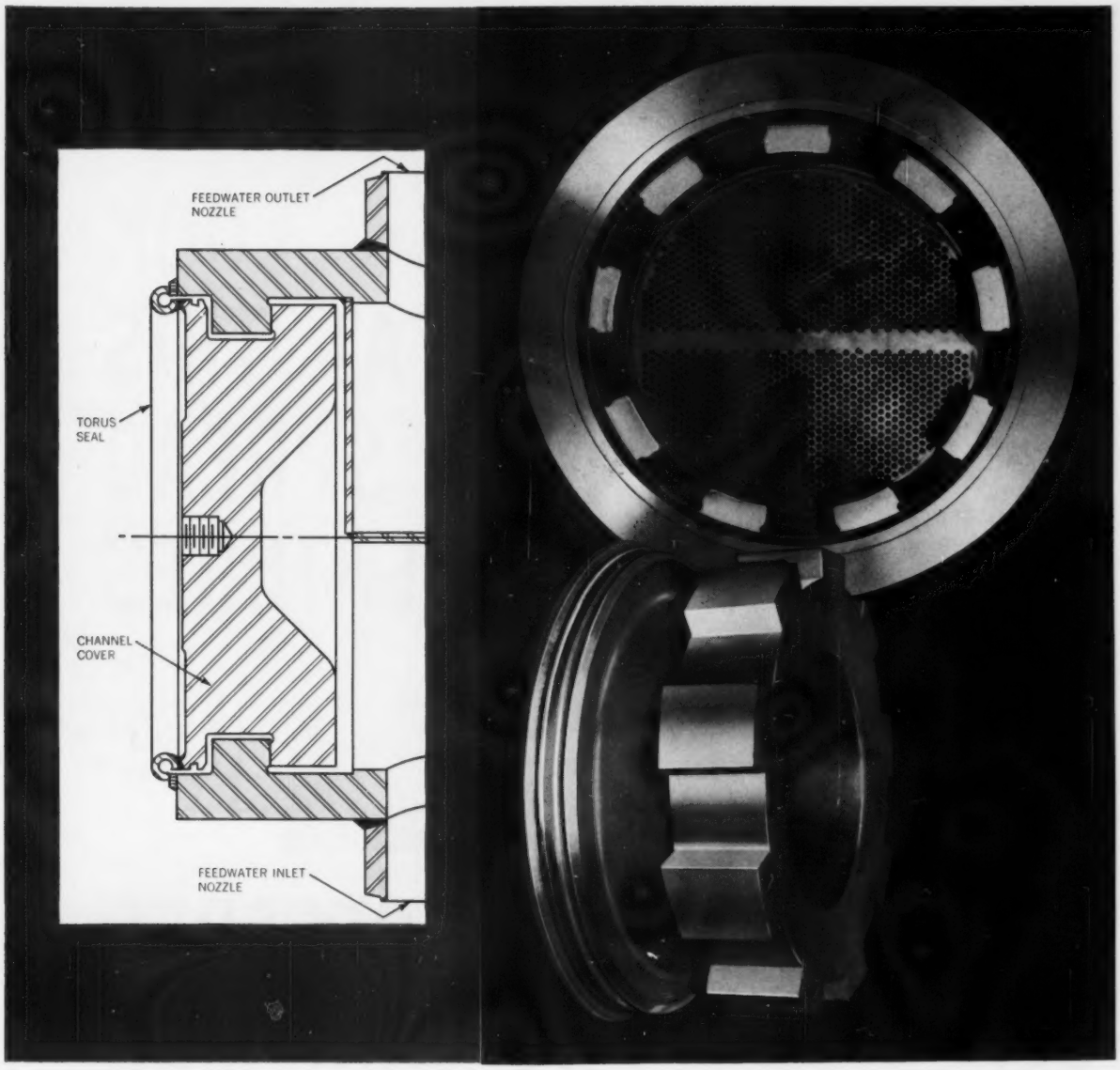
With Consotrol Recorders you can put records of *all* important trends on your console without crowding or limiting visibility. The same compact Consotrol design also is available with automatic control functions. Get full details on the complete modern Consotrol Line. Write for Bulletin 13-18. **The Foxboro Company, 244 Norfolk St., Foxboro, Mass.**

*Reg. U. S. Pat. Off.



(½ actual size)
Available in 3-27 psi or
3-15 psi air signal

FOXBORO
REG. U.S. PAT OFF.



New Breech-Lockhead for Feedwater Heaters

This new closure combines quick-opening convenience with an all-welded seal that is *gasketless*. It is leakproof under the most severe thermal shocks. Yet the pressure cover can be removed quickly with simple tools.

The new Breech-Lockhead closure consists of two parts: (1) a pressure cover that resists the hydrostatic pressure by means of interlocking lugs on the cover and channel, and (2) a torus seal consisting of a partial torus welded to the edges of the channel and cover by a simplified welding procedure.

The torus provides a leakproof seal independent of the hydrostatic pressure on the cover.

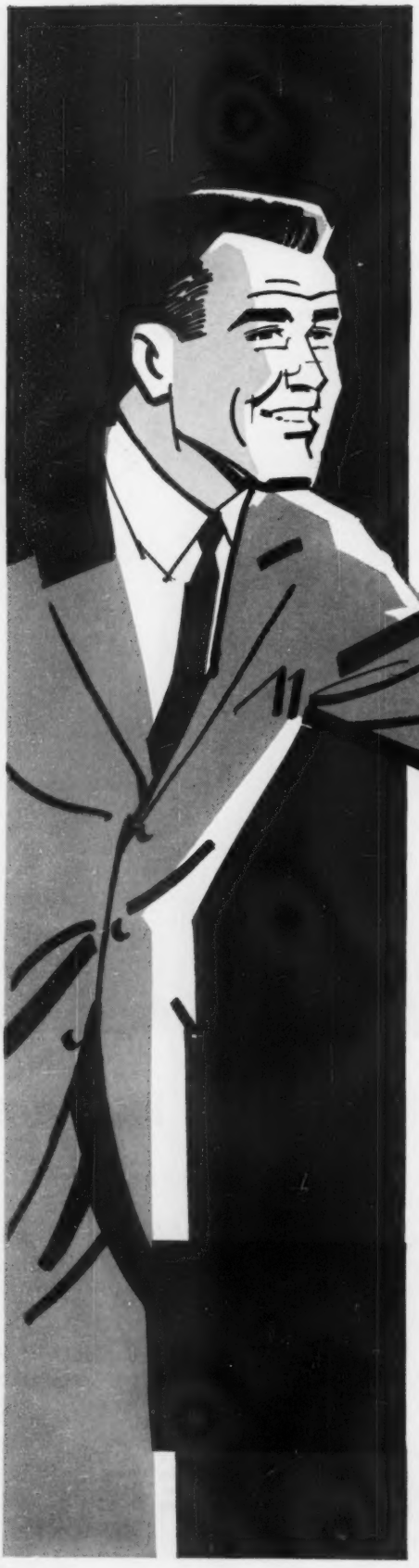
Assembly and re-assembly are facilitated by carefully designed tools furnished with the feedwater heaters. The speed, simplicity and ease of the entire operation are worth investigating.

More specific information will be sent on request. Address your inquiries to Foster Wheeler Corporation, 666 Fifth Avenue, New York 19, New York

Heat Engineered products, plants and processes . . . for the world's industrial progress.

FOSTER WHEELER

NEW YORK TORONTO LONDON PARIS MILAN TOKYO



LOOK AT THIS NEW SPREAD OF FEATURES

OFFERED BY KUHLMAN THIS YEAR

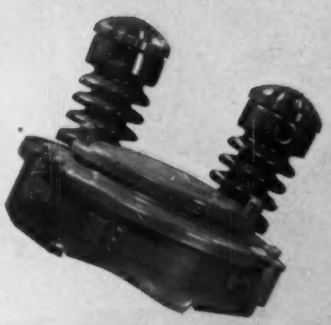
at no additional cost to YOU!

DUAL RATINGS plus bonus life. You get an additional 12% more KVA with every Kuhlman transformer . . . Kuhlman SPI-65* improved insulation with superior thermal characteristics lengthens transformer life.

Licensed under Westinghouse Insuldur patent rights.

DOUBLE PROTECTION

against wildlife. "Quick-Grip" HV bushing terminals and celuclad covers, exclusive with Kuhlman, insulate all live parts against outages caused by birds and animals. Line connections are simpler, faster, and require no tools.



All new 500 KVA

Light weight 167 KVA

Compact 25 KVA

Two bushing conventional

One bushing conventional

ALL RATINGS POLE MOUNTED

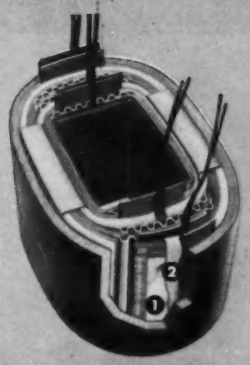
through 500 KVA. New Kuhlman light weight designs, with more compact core and coil, are up to 50% lighter and 40% smaller than previously. Losses are 25 to 30% lower.

"LUCITE" FINISH

stays brighter longer! New 4-step finishing system for all Kuhlman transformers includes: (1) thorough cleaning, (2) corrosion resistant primer, (3) bonding sealer, (4) DuPont Lucite Acrylic Lacquer.

LIGHTER, SAFER COIL

in new Kuhlman transformers! (1) Equalizing shield protects against sudden surges. (2) Special insulation provides more compactness with a higher margin of safety.



KUHLMAN TRANSFORMERS

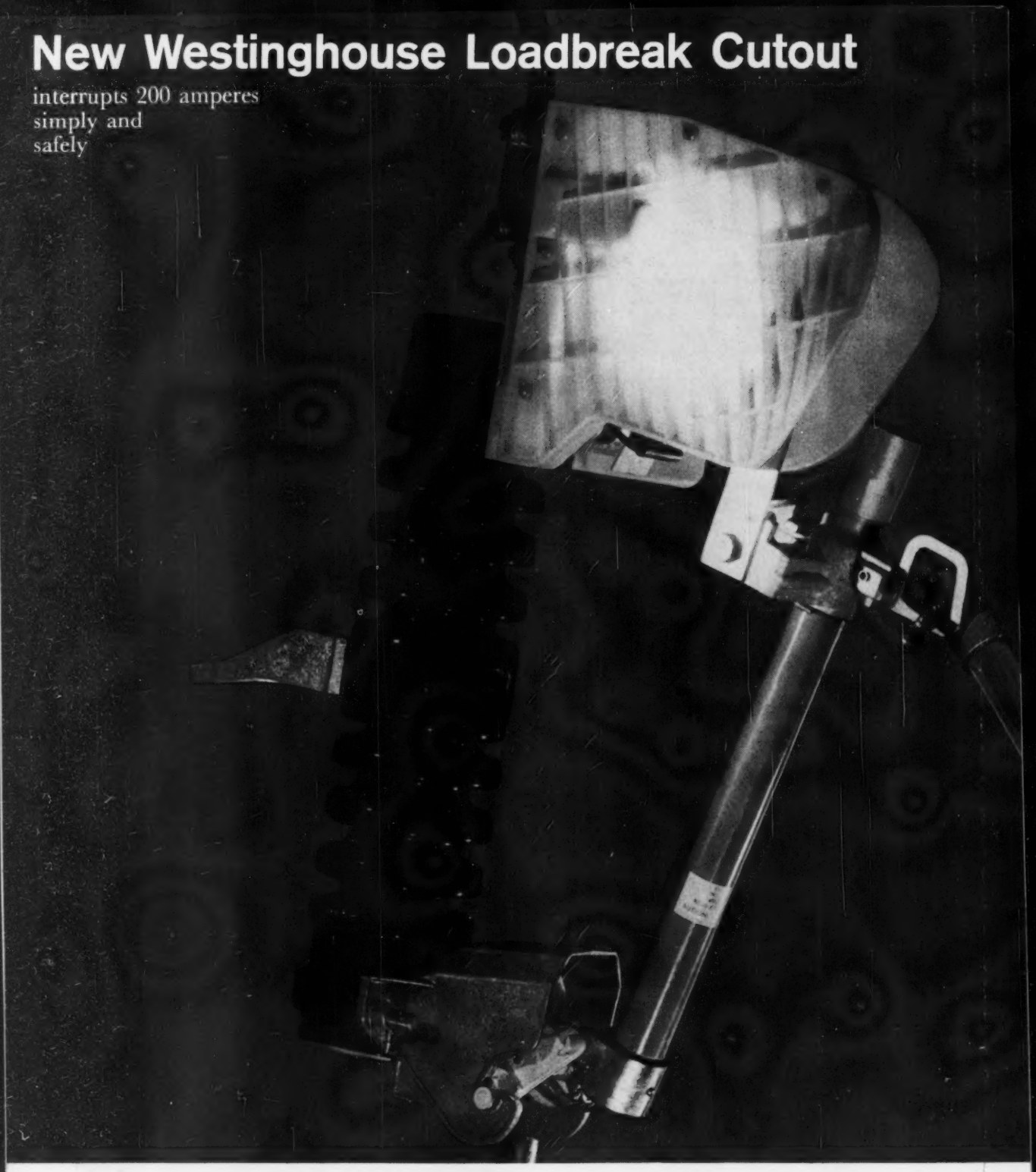
Manufacturers of transformers since 1894

KUHLMAN ELECTRIC COMPANY, Birmingham, Michigan

FACTORIES: Bay City, Mich. Crystal Springs, Miss. Salinas, Calif.

New Westinghouse Loadbreak Cutout

interrupts 200 amperes
simply and
safely



Open it safely

arc is confined within chute. The LBU is a self-contained cutout capable of breaking high load currents repetitively and is priced only $2.50 to $3.50 more than a standard open cutout. No special operating tools required; merely open in the conventional manner. No fuse link or gas bottle to replace—arc chute will last the life of the cutout.

Development of a new thermoplastic with exceptional nontracking quality, Delrin,* was the big arc-chute design break-through. When the blade is opened, a de-ionizing gas is generated from the thermoplastic by the arc heat. The gas, aided by the fast snap action of the blade, quickly extinguishes the arc within the chute, completing the simple yet safe loadbreak operation.

J-65000-1

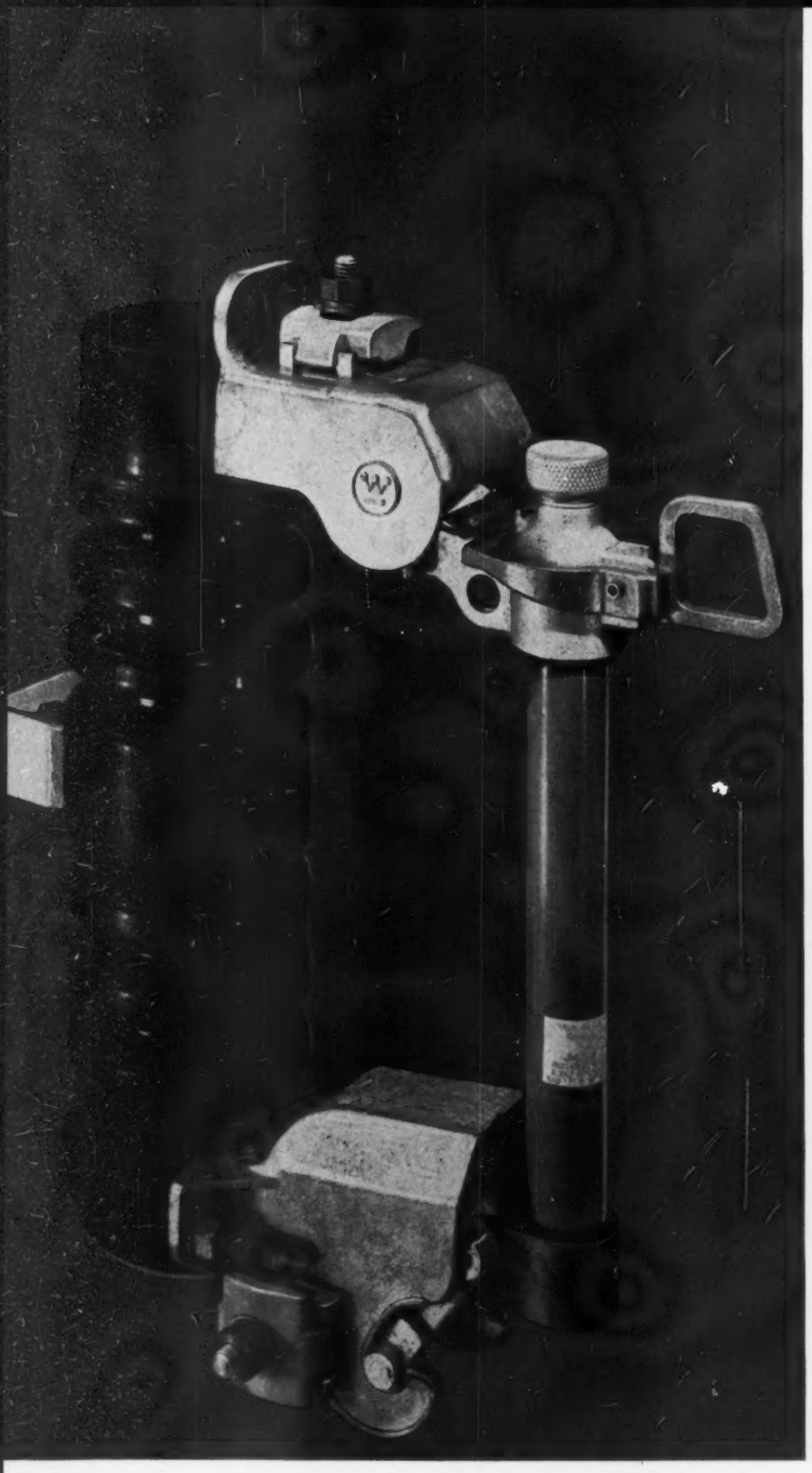
*Trademark of Du Pont

Close it simply

After 200 laboratory loadbreak operations, at full interrupting rating, with no maintenance, the arc chute showed negligible wear and only slight discoloration. The newly-developed thermoplastic arc chute has been completely tested, including ice test and accelerated weather test. Extremes of *temperature and sunlight* have no deteriorating effects.

also ▶

J-65000-2



Positive latching of the top contact, to prevent accidental opening. The cutout can only be opened by pulling down on the hookeye.

Cam action on the closing mechanism to reduce side-to-side movement when closing the cutout, yet to provide maximum clearance for rehanging fuse tube.

Spring loaded flipper, to help eject the fuse pigtail during a fault interruption and also to provide a positive latch for the bottom toggle mechanism.

Large wingnut with non-rotating washer and snubbing post, to clamp fuse pigtail with no slippage or fraying.

Heavy duty or extra-heavy duty service, for a wide range of fault current interruption requirements.

Tin-plated clamshell type terminals, suitable for aluminum or copper conductors from No. 8 to 4/0 ACSR.

Silver-plated contacts, to reduce temperature rise.

All parts made of non-ferrous materials, for long life under all atmospheric conditions.

LBU LOADBREAK FUSE CUTOUT RATINGS
15 KV—100 amp continuous current rating, with 200 amp loadbreak rating. (Equipped with an arc chute capable of interrupting 200 amp load at wide ranges of power factor.)

	NEMA Interrupting Rating RMS Asymmetrical Amps
Heavy duty, solid cap	4000
Heavy duty, exp. cap	8000
Extra heavy duty, solid cap	8000
Extra heavy duty, exp. cap	16000
Disconnect (200 Amp)	—

LDX OPEN FUSE CUTOUT RATINGS
100 amp continuous current rating

	NEMA Interrupting Rating RMS Asymmetrical Amps	
	7.8 KV	15 KV
Heavy duty, solid cap	5000	4000
Heavy duty, exp. cap	10000	8000
Extra heavy duty, solid cap	10000	8000
Extra heavy duty, exp. cap	20000	16000
Disconnect (200 Amp)	—	—

a new open cutout

On both the LBU Loadbreak and the LDX Fuse Cutouts, you get all the design features listed at the right.

For complete information, call your Westinghouse Sales Engineer. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

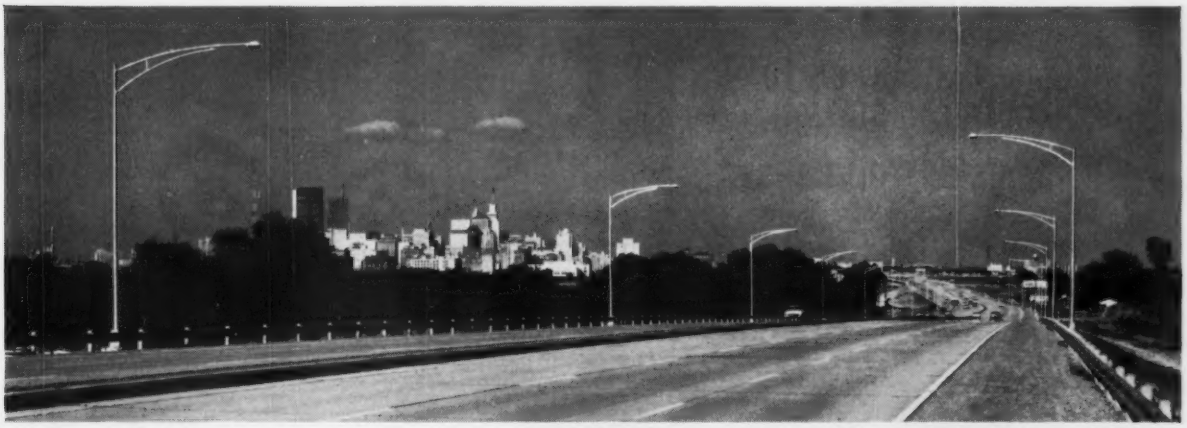
J-65000-3

Westinghouse

MONOTUBE POLES in steel or aluminum

. . . engineering and styling to meet today's rigid outdoor lighting requirements

Business District Lighting



Highway Lighting

Residential Lighting

Area Lighting

UNION METAL

THE UNION METAL MANUFACTURING COMPANY

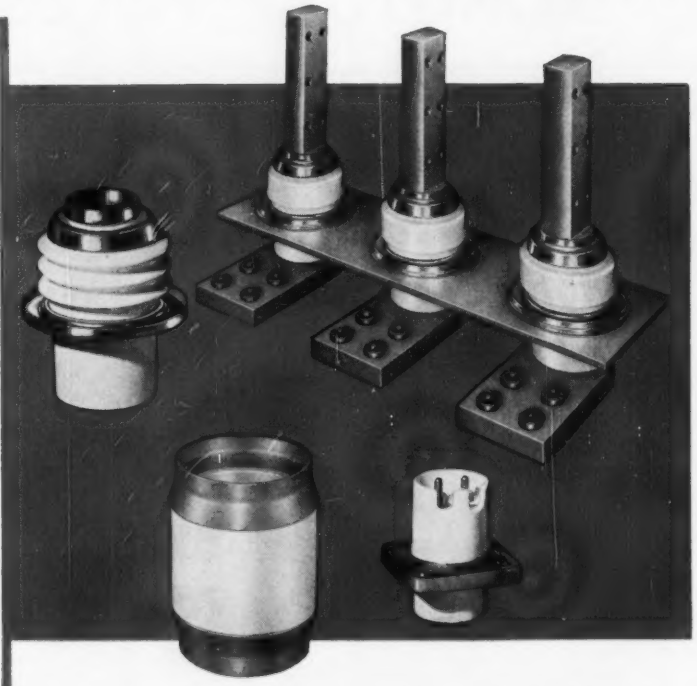
Canton 5, Ohio Brampton, Ontario

Monotube Engineered Lighting Poles

ALITE® HIGH-ALUMINA HERMETIC SEALS AND BUSHINGS

Combine...

- VACUUM-TIGHTNESS
- SUPERIOR MECHANICAL STRENGTH
- HIGH TEMPERATURE AND HEAT-SHOCK RESISTANCE
- RELIABLE ELECTRICAL CHARACTERISTICS
- HIGH RESISTANCE TO NUCLEAR RADIATION
- PRECISION TOLERANCES



Transformer bushings (both high and low voltage) . . . underground cable insulators . . . power cable end seals . . . switchgear contact insulators — these are just a few of the places where Alite is solving reliability and maintenance problems for the electrical industry.

With maximum working temperatures in the range 1300°-1600°C., Alite can be metallized and brazed to metal parts to form rugged, vacuum-tight seals which, in turn, can be welded into final assemblies.

From design to finished part, every manufacturing step — including formulating, firing, metallizing and testing — is handled within our own plant and carefully supervised to assure strict adherence to specifications, utmost uniformity and reliability.

★ ★ ★ ★

The Alite parts and products listed at the beginning of this advertisement are typical of the special design problems on which Alite engineers stand ready to help. In addition, over 100 standard sizes of Alite bushings in a range of types are also available to simplify design problems, speed delivery.

Write for FREE Helpful Bulletins

Bulletin A-7R provides detailed description and specifications of Alite. Bulletin A-40 describes Alite facilities and complete line of standard bushings.

ALITE DIVISION

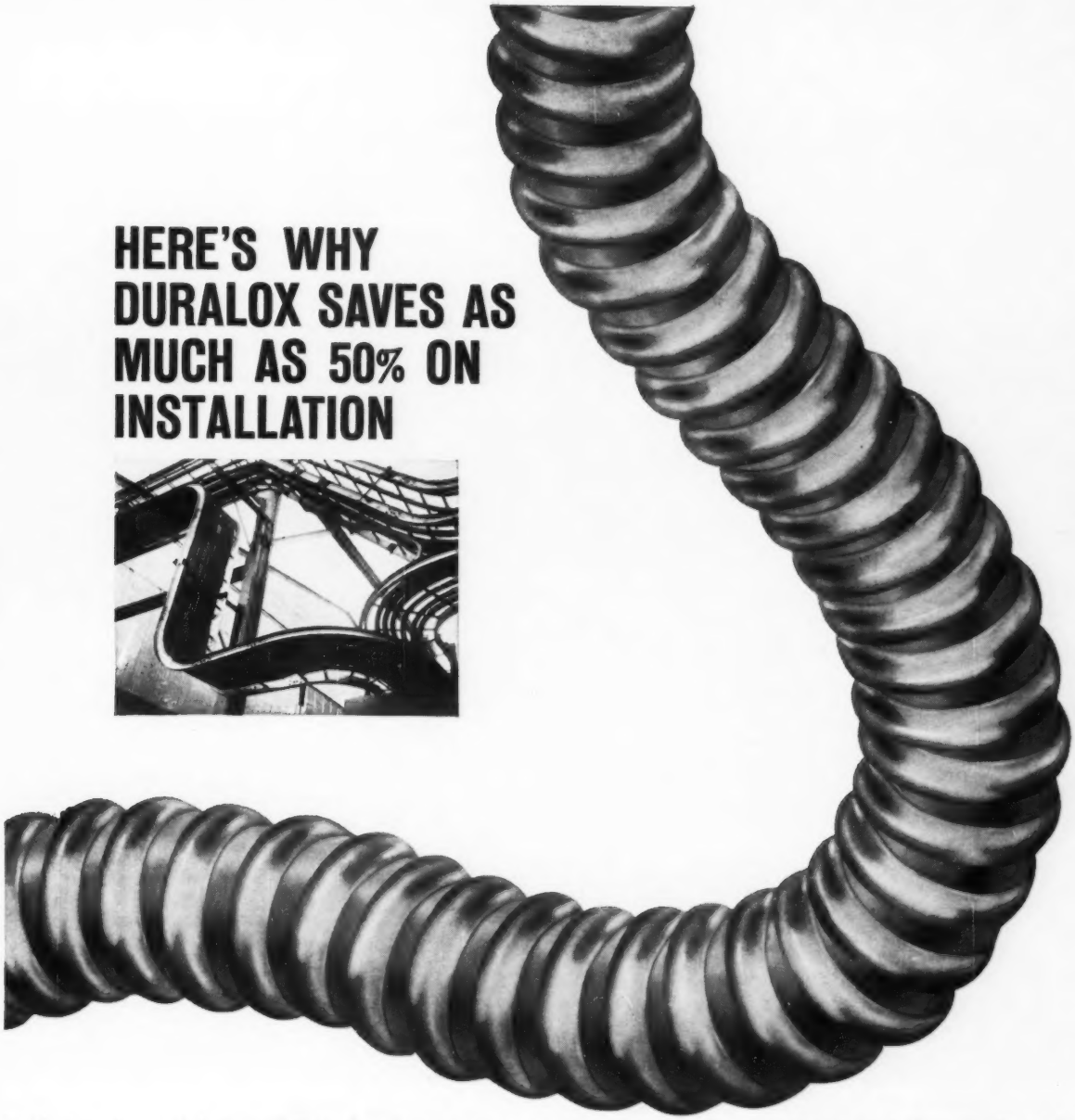
U. S. STONEWARE

BOX 119 ORRVILLE, OHIO

New York Office
60 East 42nd St.

389-G

HERE'S WHY DURALOX SAVES AS MUCH AS 50% ON INSTALLATION



Duralox* needs no conduit—saves time, money, man power . . . provides greater safety! Duralox is enclosed in its own durable, yet flexible metal armor. Thus, it can be installed *without* conduit—in long runs over and around obstructions, in racks, indoors or out. For one midwest utility this meant a savings of $5.00 per foot—over the cost of installing ordinary cable with rigid conduit!

Duralox is so flexible that additional flexible connections are not needed at motors. Duralox is easily moved—allowing for changes in design during construction or service, and facilitating repair work on other apparatus.

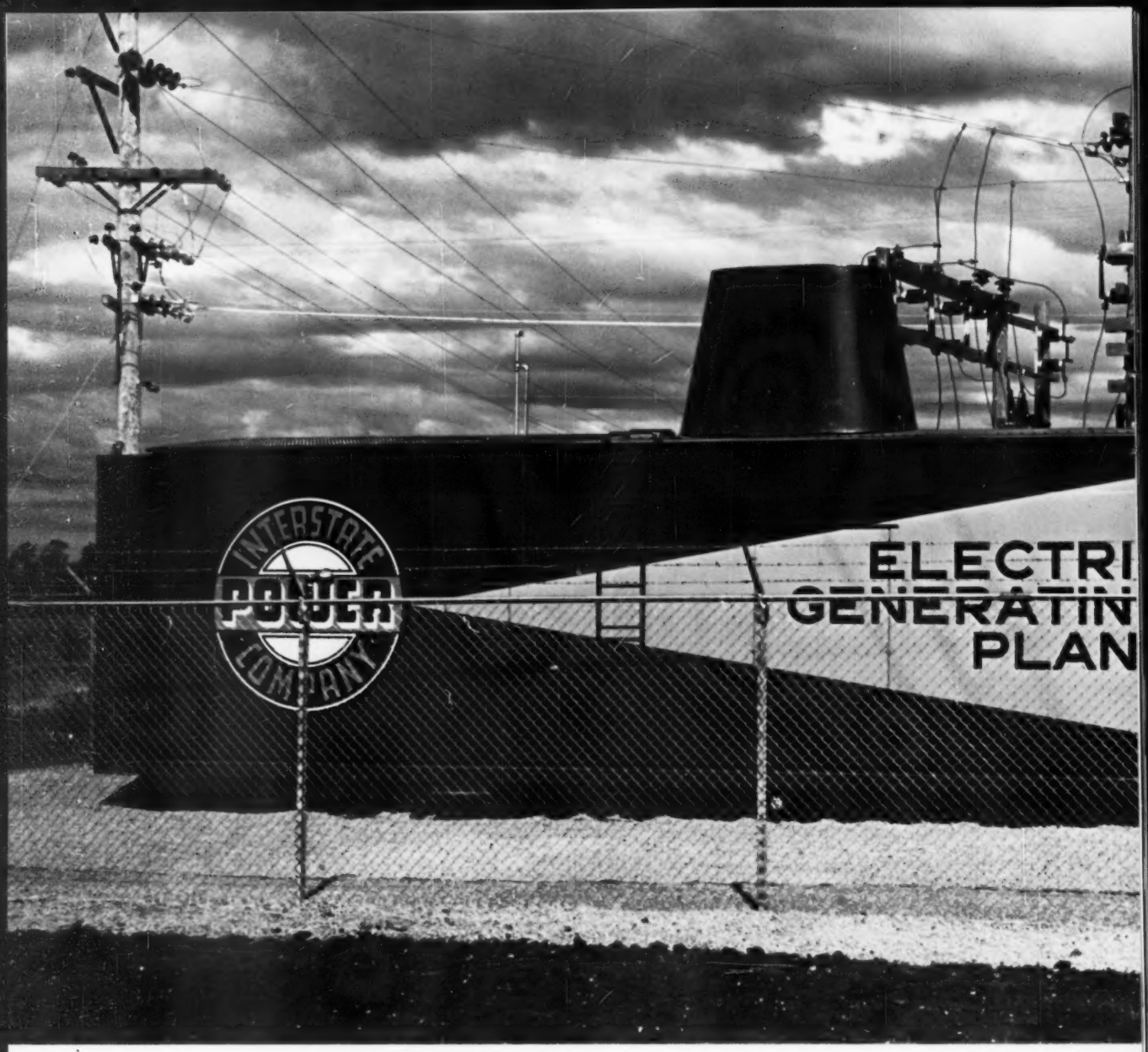
Because cables are always shielded, Duralox means greater safety. And Duralox's lower reactance in higher voltages—from the close spacing of conductors—results in reduced voltage drop and more efficient power distribution. Anaconda Duralox Cable is available in all popular sizes and voltages—copper or aluminum conductors with paper, rubber, plastic or varnished-cloth insulation. Anaconda Duralox is also available for control circuits.

Because Anaconda supplies all the accessories you need, you also get the advantages of completely compatible components and the reassurance of unit responsibility by the manufacturer. For more information on Anaconda Duralox Cable, write for Bulletin DM 5606 to Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York, Department EFL-1-EW.

Duralox has Anaconda Butyl (AB) rubber insulation
for • extra-high resistance against ozone
• exceptional moisture resistance
• 22% more current-carrying capacity
than 70° centigrade insulation

*Reg. U. S. Pat. Off. 61261U

SEE THE MAN FROM
ANACONDA®
FOR BUTYL-INSULATED
DURALOX POWER CABLE



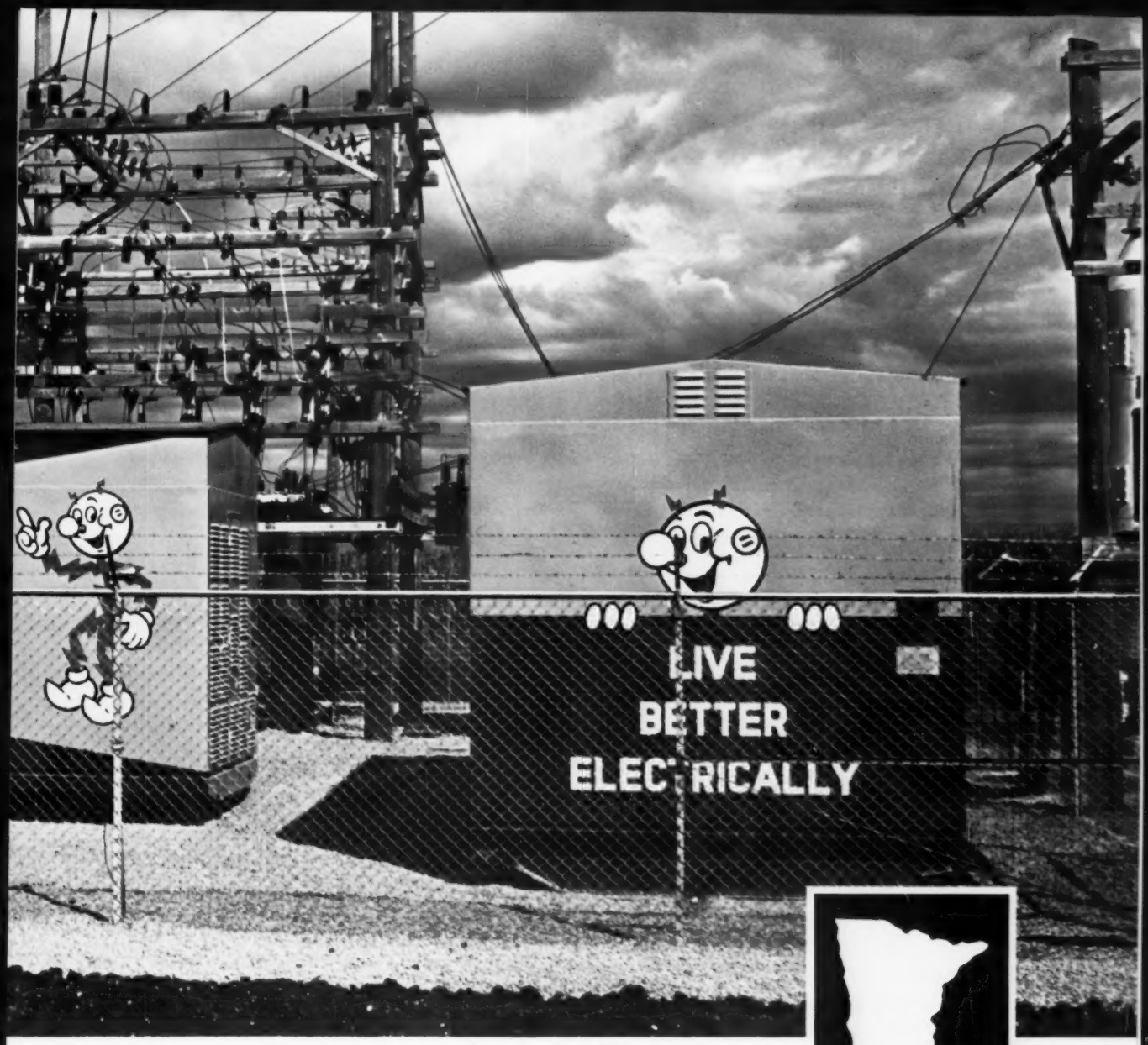
Interstate Power Insures Service with

Interstate Power Company has installed a 2000 KW Electro-Motive Diesel Plant at Hills, Minnesota, to provide peaking power and area protection to Hills and five other communities in the western end of the system.

The installation of Diesel Peaking Power made it possible for Interstate Power to economize because it eliminated the need for a more costly second transmission line. And the automatic deadload pick-up feature of the Electro-Motive equipment also makes it possible to protect the area against emergency line outages. Designed for automatic control, the new 2000 KW Plant synchronizes and goes on the line in less than two minutes. On several occasions since its installation, when transmission line trouble occurred, the Electro-Motive Plant automatically picked up the area load and maintained it until the system returned to normal.

FLEXIBLE AND RELIABLE—The inherent design characteristics of the Electro-Motive Equipment at Hills, Minnesota, that make it ideal for peaking and area protection, also make these Plants ideal for many of your system requirements:

- fast start for spinning reserve
- automatic deadload pick-up for area protection



Electro-Motive Peaking Plant

- unattended operation for remote control peaking service
- portability for simple installation
- freedom from damage to components caused by rapid thermal changes occurring from start to full load

Available in units from 2000 KW to 10,000 KW, the Electro-Motive peaking equipment line contains both Diesel and dual-fuel plants that can permit matching the plant to exact requirements for the most economical and efficient operation at the lowest investment. Ask your Electro-Motive representative for complete details.

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

LA GRANGE, ILLINOIS

In Canada: General Motors Diesel Limited, London, Ontario

(Advertisement)

RT&E INTRODUCES ARMORTEC

A New Lifetime Plastic Coating on All RT&E Pole-type Transformers —At No Additional Cost

The transformer industry has been missing the boat. In the last few years, development of various features in distribution transformers have been extremely rapid — transformers with dual voltage ratings, units designed for economical residential underground distribution, longer insulation life, and yet, all of us have been missing one of the most obvious areas where improvement in the distribution transformer should have been made — and that is in the finish that protects the transformer.

There have been paints and more paints developed for protection of distribution transformers; none really solving the problem. There is a better way of doing it which RT&E has recently adopted for all pole-type distribution transformers. This is a 100% solids system involving fusion bonding of pure vinyl to the transformer tank. We call it Armortec. This is a process radically superior to any paint finish now being used. It involves no solvent to dilute the solid materials in the finish and it involves no high pressure spraying to blow the covering material out of the crevices that need protecting.

Armortec is not a paint. It is a pure vinyl plastic. Dipped in the resin and fusion-bonded at 650°, the transformer tank, band, and cover is provided with a thick protective coating over all portions of the transformer, even sharp edges.

The superior adhesion quality is due to the fusion-bonding method using high temperature oven curing. The protective coating is of a uniform thickness, even on sharp edges and in corners. This uniform coverage fills in blind spots and corrosion traps present around lifting lugs, hanger brackets and accessories.

The fused on finish is also completely smooth. There is no problem with sag, pock and drip marks. Armortec will not chalk, crack or craze in weather and sunlight. It provides a lasting glossy, attractive appearance throughout the life of the transformer.

This process and the materials being used have been thoroughly tested in accelerated life laboratory tests equivalent to 20 years field service. These tests have shown that new Armortec finish is corrosion-proof, fade-proof and maintenance-free. There have also been three years of testing in the very worst climatic and corrosion conditions in Florida and Arizona. All of these tests show Armortec to be many times superior to paint in all respects.

This vinyl material can also be laid on the tank in much greater thicknesses than can paint. Normal paint is put on the tank between three and four mils thick. We are using 8 to 10 mils on the tank and about 20 mils on the cover and band. With this type of thickness on the cover, it also provides 1100 volts/mil of insulation, thereby eliminating outages due to birds and other animal life.

In addition, the mechanical properties of this material provide an extra tough resilient coating over the tank that resists chipping, cracking, scratching and other normal damage which can occur in handling the transformer between the manufacturer's warehouse and its final installation on the pole.

This Armortec finish is truly a lifetime transformer coating in all climatic or corrosive conditions encountered anywhere in the country. This outstanding finish is being provided *at no price addition.* It will be provided on all RT&E distribution transformers . . . and how can this amazing Armortec be provided on all units at no extra cost? The answer is simple. RT&E insists on the best and concentrates on a single idea — a better transformer. Here is a transformer finish that is radically new, and will solve all corrosion problems involved in a transformer installation.

RT&E Corporation
Waukesha, Wisconsin
Portland, Oregon • Arlington, Texas

Ask your RT&E representative to demonstrate this Armortec finish.

Editorial Comment

APRIL 17, 1961

Needed: New Practices to Keep Aerial Devices Safe

Aerial devices have sparked a veritable revolution in line work. First applied to speed line clearing only 11 years ago, they speedily gained acceptance for overhead line construction and maintenance. Today, aerial devices are being adopted in many utility fleets and linemen in them have little need for spurs.

Linemen in aerial buckets work in situations almost unexplored in the annals of safety engineering. Accidents have occurred. These accidents, if they were fully reported and analyzed, could spur the development of proper operating procedures and help manufacturers to improve the device.

Uninhibited reporting of one recent accident by a Southern utility revealed a hazard which held no threat for the man in the basket. In this case, the lineman had maneuvered himself into position, unaware that the boom behind him had contacted a hot wire. Only when he saw his helper in trouble on the ground did he discover and clear the contact.

The victim escaped with a blistered finger. But the industry was shocked into recognizing that failure of an aerial device's insulation can put potential on the supporting truck where, like a coiled snake, it can strike down any person on foot who brushes against it.

Design and tests can be devised to guard against such hazards. Probably the simplest—and certainly an effective one—would be hi-potting of every new device by the manufacturer under conditions simulating line contacts but with voltage well above the highest for which the aerial device will be used. Periodic insulation-resistance or hi-pot tests should be made subsequently by the user to detect any deterioration in the original insulation.

Such a device can no longer be considered—and tested—just as a vehicle. It is a mobile hot-line tool and must be given the same kind of care and tests—and by the same kind of electrical specialists—as those which made hot-sticks safe.

The industry must move speedily to prevent unnecessary accidents which could slow its adoption of promising aerial devices.

Commercial Electric Cooking: Tremendous Natural Growth

Commercial electric cooking has been showing steady increases since *Electrical World* ran the first survey back in 1953. It was estimated then that 77,726 kw were added in 1950 and that total commercial cooking load was 777,626 kw. By 1953 it was 1,140,988 kw. This jumped to 3,848,858 kw in 1960. EAR added in 1950 was $1,633,000. It rocketed to $11,541,990 last year.

The message is plain: Commercial electric cooking is a growing load. Utilities not paying attention to it would do well to investigate. One fact noted in the current report (see p 65-72) is that the recent recession has cut commercial cooking sales of some utilities. Twenty-nine companies were off from 1959 load levels. But total load was up—461,170 kw, or an average of 6,905 kw per company.

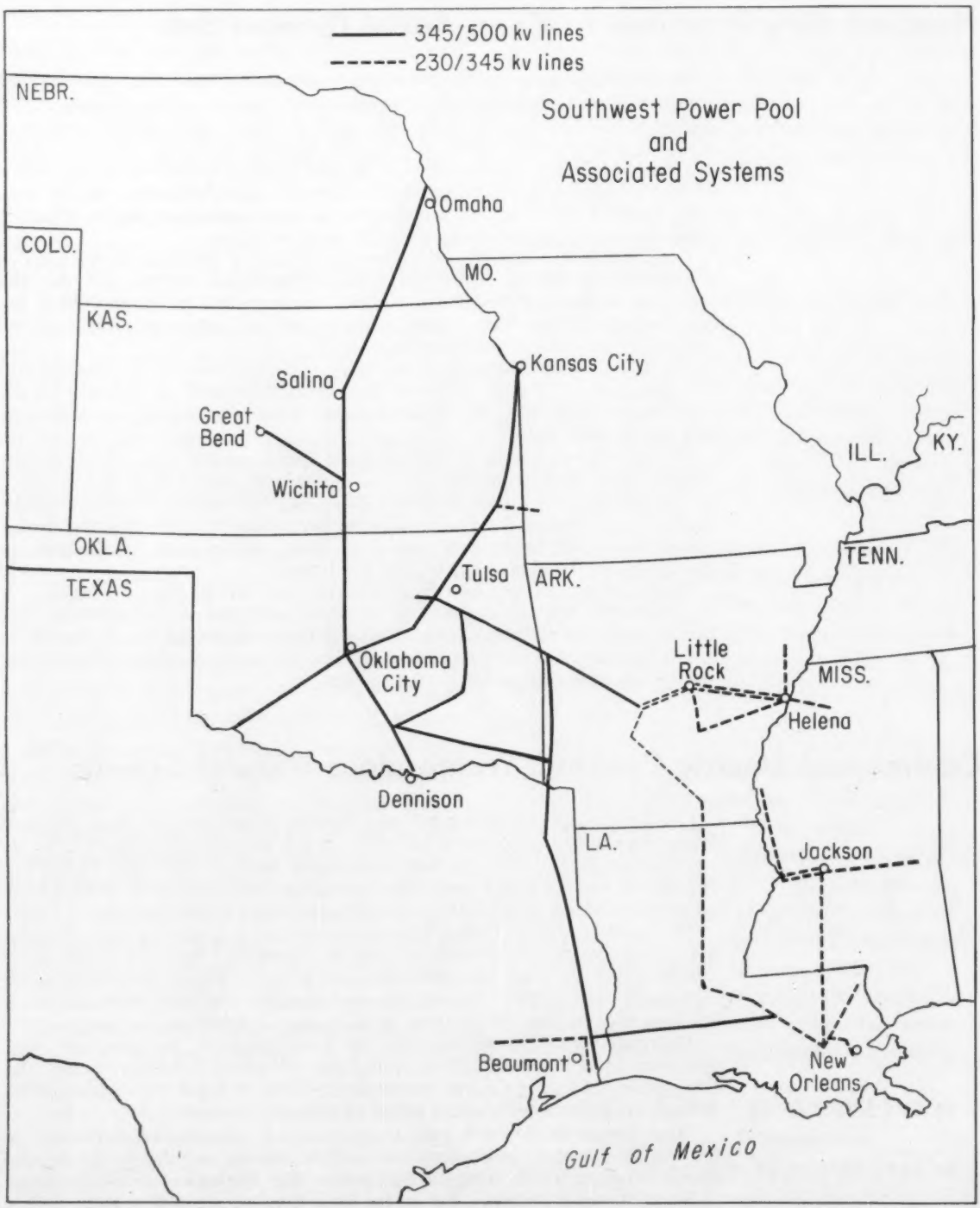
The report shows another fact: Not all of the companies are going after their full share of this market! Three companies—Southern California Edison Co, Commonwealth Edison Co, and Pennsylvania Power & Light Co—accounted for 20% of the total kilowatts added by all 74 reporting companies.

Other companies have new ways to get this load. Kansas Gas & Electric Co for example, adopted a new commercial cooking rate last year that has no demand charge. Cooking is now its biggest load builder after lighting and air conditioning.

We salute these utilities. But at the same time we regret that more utilities aren't sharing in this tremendous natural growth.

Giant Investor-Owned EHV Overlay

- About 4,000 miles of 230 and 345-kv lines will be built
  - Construction of parts of EHV overlay to begin this year
    - Conversion to 500-kv operation is foreseen for some lines



SOUTHWEST AND MIDDLE SOUTH Power Pools will build 4,000 miles of line strongly tying 12 million kw of generation

to Beef Up Eight-State Grid

Conceptual plans leading to the building of a "super power grid" involving at least 4,000 miles of 345-kv and 230-kv line in eight Midwest and Southwest states are being announced by a group of investor-owned companies centered on the Southwest Power Pool.

As reported in the plan, the 345-kv portion of the power grid will stretch north-to-south about 800 airline miles from Omaha, Neb. to Beaumont, Tex., through Kansas, Oklahoma and Arkansas. The 230-kv network in Arkansas, Louisiana, and Mississippi will extend the grid south and east so that it will reach about 700 airline miles east-to-west from Meridian, Miss., to the Texas border in southwestern Oklahoma.

Construction Begins This Fall

Cost of the proposed system is estimated in excess of $300 million. The first part of the 230-kv network will go into service shortly in Arkansas. Construction of initial portions of the 345-kv grid will start this fall in Kansas and Oklahoma. *Electrical World* learned, that planning calls for completion of most of the "backbone" by 1970, and essential completion of the 4,000 miles of line by 1975. In general, construction of transmission lines will be started quickly in heavy load areas, with more lines to be built as loads develop.

Initial participants in the super power grid are reported to be: Arkansas-Missouri Power and Arkansas Power & Light; Central Kansas Power, Kansas Gas & Electric, Kansas Power & Light, and Western Light & Telephone; Central Louisiana Electric, Louisiana Power & Light, New Orleans Public Service and Southwestern Electric Power; Mississippi Power & Light; Empire District Electric, Kansas City Power & Light, and St. Joseph Light & Power; Oklahoma Gas & Electric and Public Service of Oklahoma; and Gulf States Utilities.

Reports say that member companies of the Southwest Power Pool regard the super grid as an overlay network of interconnections now existing among pool companies. It will provide stronger transmission ties for the more than 12 million kw of capacity now in the eight-state area. The grid will allow participating utilities to install larger generating units. Interconnected utilities also will be able to interchange large blocks of power to meet individual system peaks as they are fashioned by daily and seasonal weather variations.

Electrical World hears that discussions currently are underway between power pool members and neighboring systems to extend the grid beyond the boundaries shown in the accompanying illustration. And it is expected that the grid will connect with non-investor-owned systems. While there is general agreement over the conceptual plan, physical ownership and operation of the various planned lines in the grid have not been firmly set.

Construction by Kansas G&E will start this fall on 128 miles of single-circuit line from Salina south to the Oklahoma state line, KG&E told *Electrical World* that all portions of the 345-kv super grid in Kansas will be wood-pole, H-frame construction, using 795-MCM ACSR bundled conductor. The 128-mile line will be designed for operation at 345 kv. Any increase to a voltage higher than 345 kv will have to be determined by engineering studies of the most economical voltage level for the size of power blocks to be transported.

According to Fred Kimball, KC&E vice president. "The extra high voltage lines are scheduled to be built as rapidly as they are required for us to accomplish the operating efficiencies we hope to achieve." Thus, KG&E plans 87 miles of 345-kv line from Salina northeast to the Nebraska line, in cooperation with Kansas Power & Light and Western Light & Telephone. Spokesmen for Omaha Public Power District, with whom KC&E now is tied with a 161-kv line, said "In general, Omaha is a likely terminal for the 345-kv line and is worthy of study to determine its economics, but we have no specific plans at this time to build the extension in Nebraska."

From its Neosho plant near Parsons, KG&E plans 129 miles of 345-kv line north to Kansas City Power & Light and 22 miles of line south to the Oklahoma border. Working with Western Light & Telephone, KG&E will build 87 miles of 345-kv line west from Wichita to Great Bend. The company reports it also plans a 28-mile section of 230-kv line from Neosho plant east to the Missouri border as part of the planned grid. "Present forecasts," said Kimball, "indicate that most, if not all, of the planned lines will be in service by 1970." These 480 circuit-miles of 345-kv and 230-kv line will cost more than $21 million.

Preliminary work already is underway on the first link of the super grid in Oklahoma; a 30-mile tie between PS of Oklahoma and OG&E from Sand Springs to Bristow to be placed in construction this fall. This single circuit wood-pole H-frame line, to operate initially at 138 kv, has right-of-way for 345-kv operation as part of the super grid and "is designed for ultimate operation at 500 kv." Other projected lines in the area are "subject to further review and general studies with the companies affected."

Plans for first 239-kv in Arkansas P&L area extending the 345-kv grid into Arkansas have not been carried to the point where the construction schedule or the company building the facilities can be determined at this time, Paul O. Canaday, president of Arkansas Power & Light, told *Electrical World*. But AP&L will place in service within the next few weeks about 90 miles of single-circuit 230-kv line between Helena and Pine Bluff. This line will be part of the overall grid and marks the first 230-kv construction in the area, prior to which 161 kv was highest voltage.

As required, said Canaday, this 230-kv line will be built to Little Rock. And future plans could include the proposed double-circuit 230-kv line from Helena, through Little Rock, to Jones Mills, where the 345-kv line may terminate. Regarding the planned southern extension of the 230-kv network to Louisiana, Canaday said that AP&L probably will build that portion of the network in Arkansas.

Senators Interrogate Swidler And Morgan for FPC Jobs

Nominees for the Federal Power Commission declared last week that their previous sympathies for public power development would not prevent them from judicially carrying out duties at the FPC.

Joseph C. Swidler, who is President Kennedy's choice for chairman of FPC, told the Senate Interstate & Foreign Commerce Committee during confirmation hearings that he would not have accepted the nomination if he had felt he could not discharge his duties "without prejudice and without bias." Howard Morgan, who was formerly public utility commissioner in Oregon, told the subcommittee that he did not think that public power should be allowed a monopoly position any more than private power should be.

However, both nominees emphasized that they intended to protect the public interest if confirmed for the FPC positions; they indicated that this meant primarily consumer interest.

Senators sitting in at the first two sessions of the hearing asked very few searching questions and appeared easily satisfied with general answers. Morgan's hearing went smoothly and was concluded in two hours, but Republicans on the committee said they would want to question Swidler further before taking a vote. No date was immediately set for the next hearing on Swidler.

MORGAN: "Public interest focuses mainly on consumer interest"

In response to questions from Sen Mike Monroney (D-Okla.), Swidler said that he did not believe in "universal public ownership" of power facilities. He said he thought the public benefited from the present mixture of private and public power in this country. He said the competition between investor utilities and publicly owned utilities was valuable in bringing better service and lower rates to electric consumers.

Answering a question put forward by Sen Andrew Schoeppel (R-Kan.), Swidler said that communities should always have a free choice as to their source of electric power.

Swidler admitted that he had been forced to resign from his TVA post for activity in connection with the confirmation hearings of TVA Board Member Arnold Jones. Answering questions of Sen Hugh Scott (R-Pa.), Swidler said the forced resignation had come about in this way:

He had been handed a booklet about natural resources in Kansas and asked to prepare a series of questions to be asked of Jones during his 1957 hearings. Swidler assigned the task to one of his assistants but never saw the questions and never approved them. TVA Board Chairman, Gen Herbert Vogel, somehow got a list of the questions later and showed them to Swidler, telling Swidler that the questions were grounds for dismissal.

However, Swidler said he prevailed upon Vogel to allow him to resign in order that he might retain his pension rights as a government worker.

Swidler twice told the committee that he was aware the FPC was an independent commission and an arm of Congress. But he nodded assent when Acting Chairman John Pastore (D-R.I.) said that Swidler would not forget that he had been appointed by the White House.

Morgan under lengthy questioning by two Republican committee members — Sens Schoeppel and Norris Cotton (N.H.)—gave these views on utility regulation:

SWIDLER: Does not believe in "universal public ownership"

- He would protect the "public interest" as an FPC commissioner, and he emphasized that "public interest focuses mainly on consumer interest." Morgan agreed there are major difficulties in meeting a balance between consumer interest and the corporate interest of regulated utilities, but he said his "first responsibility" would be in approaching each case "without pre-judgment."
- He is "very sympathetic" to public power, but is "not in all cases predisposed toward public power" over investor-owned power.
- Morgan said he hoped the FPC never would have to make a decision between fish and power interests—that adequate fish studies could keep up with dam development, so that such a choice wouldn't be necessary.

On this subject, Morgan said Interior Secretary Stewart Udall's plans for a "crash" fish study of the Snake and Salmon Rivers in Idaho held "bold promise," and he implied that he would favor a delay in the pending High Mountain Sheep-Nez Perce application case until Udall's study is completed (in late 1964).

Pastore suggested that Morgan consider putting Udall on the stand in the High Mountain Sheep-Nez Perce hearing to determine whether a four-year delay in the case would be worthwhile. Morgan said this would be a "fair solution."

Morgan said he wouldn't want the Commission to "make a mistake" on the pending, rival license applications, and he said he thought the FPC should give "serious consideration to the request by a public servant (Udall) charged with protecting the conservation of fish." Morgan testified that "partisans of each project claim the other project would be more harmful to fish," and he added, "both dams could do heavy, irreparable damage to fish."

Meanwhile, at the FPC last week, Interim Commissioner Paul A. Sweeney resigned his post, leaving the door open for Swidler's appointment to the commission. Sweeney had been serving under a recess appointment given him last July 15.

Cleveland Gas Utility Enters Cooling-Heating

Taking advantage of a major urban renewal project in Cleveland, a gas utility is planning an operational diversification that could be an important competitor of electrical companies throughout the country.

The East Ohio Gas Co, Consolidated Natural Gas subsidiary, has confirmed reports that it is preparing preliminary plans for a large, self-contained heating and cooling plant for the city's downtown Erieview urban renewal project.

The utility's plans call for a single plant, located somewhere in the Erieview area, which would supply heating and cooling for the buildings to be constructed in a 190-acre tract in the heart of the city.

In effect, East Ohio, instead of selling natural gas for heating and cooling, would be expanding its operation to selling heating and cooling itself.

Robert W. Ramsdell, East Ohio president, said that the company expects that the project will cost between $5 and $10 million, depending on the size and number of buildings becoming part of Erieview. He pointed out, that in any event, the plant and all necessary piping would be so designed that it could be expanded to meet the needs of the future.

Six More Damage Suits Filed

The US government has filed six more damage suits in the wake of the antitrust actions against the electrical manufacturers. All the suits are in behalf of various federal agencies. In three, covering turbine-generators, power transformers, and power switchgear assemblies, TVA is also a plaintiff.

Like the previous suit covering oil and air circuit breakers (EW, March 20 p 56), the government is asking for double damages under the False Claims Act, and as an alternative, single damages under the Clayton Act. For TVA, the suits are asking for triple damages under the Clayton Act, and then conversely, double or single damages. But unlike the first suit, no formula has been suggested to determine damages, and no actual damage figures have been specified. Following is a list of defendants and co-conspirators named:

Power switchgear assemblies. Defendants: Westinghouse Electric Corp, Allis-Chalmers Manufacturing Co, Federal Pacific Electric Co, General Electric Co, and I-T-E Circuit Breaker Co. Co-conspirators: McGraw-Edison Co, Moloney Electric Co, and Wagner Electric Corp.

Power Transformers. Defendants: Westinghouse, Allis-Chalmers, GE, McGraw-Edison, Moloney, and Wagner.

Turbine-generators. Defendants: GE, Allis-Chalmers, and Westinghouse. Co-conspirators: Carrier Corp, DeLaval Steam Turbine Co, Worthington Corp.

Distribution Transformers. Defendants: GE, A-C, Kuhlman Electric Co, McGraw-Edison, Moloney, Wagner, and Westinghouse.

Low voltage distribution equipment. Defendants: Cutler-Hammer, Inc, Federal Pacific, GE, I-T-E, Square D Co, and Westinghouse. Co-conspirators: Norbute Corp, Murray Mfg Corp, Wadsworth Electric Mfg Co, Inc and Zinsco Electric Products Inc.

Low-voltage power circuit breakers. Defendants: I-T-E, GE, and Westinghouse. Co-conspirators: Allis-Chalmers and Federal Pacific.

In announcing the suits, Attorney General Robert Kennedy said the claimed damages "would run into the millions" and indicated that more damage suits might follow.

Chief Antitrust Prober Joins Supplier

William L. Maher, the Justice Dept attorney who headed up the recent antitrust investigation of the electrical manufacturing industry, will become assistant to the president of Joslyn Mfg & Supply Co April 21.

The former chief of the Middle Atlantic office of the antitrust division in Philadelphia will guide Joslyn in "implementing its program of compliance with the antitrust laws" and will assist employees in this respect, the company said. It also pointed out that Maher will have no duties in connection with pending government civil litigations to which the company is a party. Present counsel will continue to handle these matters, the company noted.

On his part, Maher said he was "very pleased to have been chosen by Joslyn to guide its antitrust compliance program." And although he naturally had some regrets about leaving government service, he said he was looking "forward with interest" to his "new field of endeavor in private industry."

TVA-AEC Fencing Over Power Cost

TVA attempt to raise rates activates AEC reduction in consumption through more efficient processing methods

A move by the Tennessee Valley Authority to raise the Atomic Energy Commission's $100-million annual power bill has backfired.

Now both agencies find themselves caught in the middle of an old-fashioned squeeze-play.

AEC has neatly countered TVA's reopening a 1951 Oak Ridge supply contract to renegotiate toward higher energy prices. TVA felt the 11-year-old contract was out of date and should be adjusted along the lines of more realistic and higher energy costs. But AEC simply re-evaluated its needs and quickly announced a reduction in power requirements to run its gaseous diffusion plants.

Three diffusion plants at Oak Ridge, Paducah and Portsmouth use about three times the power consumed by New York City annually. As a result of its power-push, TVA stands to lose 700 Mw of demand sales and about $23 million in annual operating revenue from the cancelled AEC contract.

Seek Political Support

The inter-agency differences over power value are giving informed Washington ample opportunity to observe that big government like big business also has its battles, as AEC lines up against TVA for multi-million-dollar stakes. Each is entrenching its position to meet possible future reverberations with arguments calculated to win Congressional friends and influence people.

A fight over the cut-back in TVA power could come up in the House Appropriations public works subcommittee which handles the purse-strings for both agencies. The Congressional Joint Committee on Atomic Energy operates as a sort of board of trustees for AEC and will probably also ask for a full explanation.

The entire Congress may want to know why AEC's efficiency of operation only now allows a power decrease instead of years earlier.

The entire nuclear power industry can lose if in the final outcome AEC decides the current enriched uranium price structure cannot be reduced because of high power costs involved in making it. AEC is now examining feasibility of decreasing costs of slightly enriched uranium as a stimulus to nuclear power development. A General Electric Co proposal now before the Commission says that two-thirds of the price of slightly enriched uranium stems from the price of crude uranium. It sells at $5 per lb on the open market compared to $8 paid by AEC. A very substantial encouragement for nuclear power will result, GE says, if AEC begins to buy crude uranium at the free market price and accordingly reduces its price for enriched uranium. Such will enable the atom to compete for "a few hundred thousand kilowatts of additional plants," according to the GE proposal.

Both AEC and TVA are tight-lipped over where matters stand right now. Both seem to be watching and waiting, after positioning their first plays in this kilowatts contest. AEC says the 1951 Oak Ridge contract with TVA was originally signed as a short-term contract and included cancellation options for both parties. TVA has already served termination notices on the Commission under its options, as the early jockeying begins. If AEC takes no positive action on the termination notices, they will run for several years and finally cancel the 1951 contract. On Oct. 8, 1961, a 300-Mw portion will terminate and 400 Mw will end June 30, 1964.

OVEC Contract Hit

A lesser amount of AEC investor power purchases, 150 Mw from Ohio Valley Electric Corp, is also involved in AEC's power cut-back. This amount is now "in the process of being cancelled," according to AEC. The total 1,050-Mw cut-back is rounded out by dropping 200 Mw from the Commission's Oak Ridge steam plant.

The total power cancellation will amount to a $35-million decrease in costs after 1964. This figure would come out of the $200-million total annual power bill presently paid by AEC for all operations at Oak Ridge, Paducah and Portsmouth.

Officially, increased efficiency in isotopic separation runs through the gaseous diffusion plants made possible at this time by a plentiful supply of raw feed material is how the Commission explains the power decrease.

Efficiency Allows Cutback

"AEC is studying electric power requirements for its gaseous diffusion plants at Oak Ridge, Tenn., Paducah, Ky., and Portsmouth, Ohio, to determine the most economical manner to reduce the total load over the next three and a half years," the Commission states. "The production goal for enriched uranium for both national defense and civilian uses can be met with reduced use of power in view of improving efficiency of plant operation and current availability of raw materials for feed.

"The decrease in the amount of power to be purchased will eventually total about 1,030 Mw, with a small amount of this already having been dropped. Although the study of how the reduction will be accomplished, the timing and the amount for each plant has not been completed, the bulk of the reduction probably will be achieved by not renewing an existing contract with the Tennessee Valley Authority."

TVA staff sources dismiss the AEC cancellation (10% of TVA's $242-million annual revenue) and sit tight on the theory that the lost sales can be made up by other customers.

TVA Chairman Herbert Vogel takes the matter more seriously in his communications with the President, however. He has written President Kennedy that the drop in TVA's load requirements will delay construction this year of the system's $125-million Edgemoor steam plant, planned to generate initially 900 Mw just 20 miles away from Oak Ridge.

W. C. MacINNES, right, presents president's gavel to his successor, O. J. Miller, Duke Power Co. R. Baxter Wilson, left, Mississippi P&L, was elected first vice president and J. J. McDonough of Georgia Power Co, second vice president

Tells SEE Industry Needs Capital

Gilmer at Boca Raton cites $31-billion requirement by 1970; Linder stresses approaches to overseas market

Electric utilities must raise $31 billion through equity financing before 1970, the Southeastern Electric Exchange was told at its 28th annual convention, March 27-29, at Boca Raton, Fla. The meeting brought together high executives of utilities, associations, and manufacturers in or with interests in the Southeastern states.

Pointing out that capital goes where there is a prospect of profit, Ben G. Gilmer, Southern Bell Telephone Co, declared that monetary experts today expect the shortage of investment capital to continue. Funds for undeveloped countries and Latin America, along with continuing public spending, he said, are draining off US available money.

It remains problematical, Gilmer said, whether a company can earn the extra money needed to meet the future with an aggressive growth program. The solution, he continued, lies perhaps in the utilities finding ways of inducing the regulatory authorities to allow them to keep a useful portion of their own profits.

To compete in the world market, our domestic manufacturers of electrical equipment must overhaul their standards to bring them closer to overseas requirements, said Clarence H. Linder, General Electric Co. Foreign markets, he noted, are becoming increasingly important to US industry generally.

Linder Cites Standards

Linder explained that while US equipment has been manufactured to provide an extra margin of reliability, European manufacturers have concentrated on conservation of scarcer component materials. He urged that the US industry reexamine standards that "impose requirements not commensurate with the value of stated needs and wants" and think of standards in terms of "tomorrow's technology and tomorrow's goods and services."

The vast technological progress on the home front, Linder said, has kept the cost of power production on a down trend, but has not helped to offset inflation with its rising costs. Accordingly, GE, he said, has put cost-reduction programs into effect and is reviewing the needs of its utility customers with a view to modifying product designs.

Although the investor-owned electric industry continues to view new projects in terms of economics, the government gives little thought to economics in proceeding with its multi-purpose water-resource programs, said J. K. Busby, Pennsylvania Power & Light Co. Economic tests, he said, should be applied to both private and public projects and should include interest rates and taxes. But the interest rates on government bonds, he noted, do not reflect risk.

The Edison Electric Institute has launched a research project with an initial budget of $250 million and with 86% of the EEI companies participating, reported Sherman R. Knapp. With a government grid a distinct probability, the industry needs to form its own power pools, neighboring company working with neighboring company in the planning, Knapp warned.

J. J. K. Shannahan, American Electric Power Co, called upon the industry for a promotion program keyed to the Administration's

(*Continued on page* 106)

- Cyclical buying and pricing problems call for changed industry perspectives
- Superpressure at Avon and Breed stress technical-economic problems
- Pumped storage assumes star role in discussions on peaking
- Materials are key to further progress in nuclear power
- Computers assume new roles in automation and planning

Fast-Changing Power Technology

The power industry must update its perspective on pricing and cyclical buying. Prices must include provision for research and development, field servicing, and training of operating personnel by suppliers. Cyclical buying must be evened out so that research can be expanded.

These views were the theme of a keynote address by W. F. Crawford, president of Edward Valves and Republic Flow Meters, at the recent American Power Conference.

Crawford noted that the level of orders has cycled as much as 5 to 1 in two years for steam turbines, 4 to 1 for boilers, and 2½ to 1 for hydro turbine generators.

Of American boiler units sold last year 19% accounted for 71% of the capacity, said Crawford. In addition, the average size of new steam turbine generators ordered has increased 46½% over the past 5 years. Fewer and larger units, Crawford said, means fewer opportunities to innovate and pioneer.

Other speakers on management at the three day conference in Chicago, March 21-23, were equally concerned with problems of competition, over-management, and manpower needs.

Foreign Competition Dictates Changes

Tougher competition from abroad requires that US industry "go through a rendering process so that the fat will disappear from the right places and muscle be built up where needed," said H. G. Ebdon, president, Combustion Engineering.

American management has paid far too little attention to overhead costs and become overmanaged, he said. Management development and specialization can be overemphasized, Ebdon added.

But the electric utility industry has maintained the price stability of the kwhr, not through happenstance but as a result of leadership, vision, and courage to invest more for the best, Ebdon said. But it must exert greater effort because, in the next 15 years, the industry will have to pay $60 billion in taxes.

Well trained manpower of high caliber is essential to the utility industry to fulfill its responsibility to its customers and the public, said Sherman Knapp, Edison Electric Institute. The 1930 depression gap in hiring is beginning to catch up with the industry, and the glamor industries are attracting most recent graduates, he said, adding that utilities must arouse interest in the industry among both university faculties and undergraduates to meet this competition.

Avon Unit Teaches Much in First Year

Early experience with supercritical pressure units at Breed and Avon stations was fully documented at APC. Elsewhere a temporary retreat from 1,100F steam was indicated, as high-cost austenitic materials make thermal gains uneconomic. But continued use of 3,500 psi found sanction particularly in combination with ascending superheat temperatures for newly scheduled units of both AEP and Public Service Electric & Gas Co.

The first year's operation of Avon 8, the 250-Mw superpressure unit of Cleveland Electric Illuminating Co having innovations that include a once-through steam generator and use of ferritic materials at 1,100F, was fully reported.

At Avon, metallurgical progress has been advanced, said C. C. Franck Sr and J. A. Carlson, Westinghouse Electric Corp. A small superpressure turbine element, weighing 3,600 lb and producing 29 Mw, made it possible to control and limit stresses in ferritic materials at 1,100F, they said, noting that small improvements were necessary on the super pressure element.

Operating experience showed the boiler to be fundamentally sound, fulfilling all reasonable expectations, said J. I. Argersinger and G. C. Smith, Combustion Engineering. Also clearly demonstrated was need for close coordination of feedwater flow and firing rate and close adherence to safety interlocks and other approved procedures.

N. F. Gill and N. D. Flack, Cleveland Electric, said that serious technical difficulties have been solved and the problem of copper deposition attacked by changes to the system. System complexity is indicated by the need to monitor 150 pressures, 350 temperatures, 150 alarm points, and 150 other items. Heat rate, initially not as good as expected, is being improved.

An entire conference session was devoted to design

W. F. CRAWFORD

H. G. EBDON

SHERMAN KNAPP

PHILIP SPORN

T. G. LeCLAIR

Poses Varied Problems

and performance of the Breed Plant of the Indiana & Michigan Electric Co. (See EW, Jan. 16, 1961, p 47.) This 500-Mw, single-unit plant which operates on steam at 3,500 psi and 1,050F with double reheat to 1,050F has until March 15 produced upwards of 700,000,000 kwhr, maintained an average load factor of 80%. The current net heat rate is 8,654 Btu per kwhr.

Philip Sporn, AEP Service Corp, contrasted advances in steam technology represented by Breed with those of 40 years ago at Windsor Station. (See table, p 59.) He characterized Breed as "only a milestone" on the road of power progress. Sporn declared that a higher level of professional skill is required today to put plants like Breed together.

In discussion R. A. Baker said that Public Service E&G is today retreating from high steam temperatures because the cost of austenitic materials cannot be justified on the basis of resulting thermal gains. He said that the 400-Mw unit now contemplated for Hudson Station, using steam at 3,500 psi and 1,000F with ascending super-heat temperatures of 1,025 and 1,050F, employs the best available steam cycle.

TVA Units to Peak at 950 Mw

Disclosure that the rating, steam conditions, and speed of TVA's units for Edgemoor Station had been changed came in a presentation on features of the Authority's Paradise Station. Formerly rated 800 Mw, the Edgemoor units have been rerated 900 Mw for operation at 3,500 instead of 2,400 psi. Steam temperature will be 1,000/1,000F instead of 1,050/1,000F, and speed 3,600/1,800 rpm. Capability for peaking is to be 950 Mw, with one top heater out of service.

R. A. Elliot, W. F. Emmons, and H. T. Lofft, all of TVA, said the initial installation of two 650-Mw units at Paradise Plant will cost $130 per kw of capability. Net station heat rate will be 8,770 Btu per kwhr at 0% makeup and 4% auxiliary power at 700-Mw capability. Individual cyclone-fired boilers will burn 11,000 Btu strip mine coal costing 14¢ per million Btu delivering steam at 2,400 psi and 1,050F with one stage of reheat to 1,000F. A general purpose digital computer will perform calculations and give partial automation and monitoring. The system is expandable.

Economics of a 678.5-Mw combined steam, gas-turbine cycle plant over a 678.5-Mw conventional steam cycle plant was offered by H. J. Petersen, United Engineers & Constructors, and J. O. Stephens, Westinghouse. They showed total cost of two such plants as essentially equal, the combined cycle showing a 3.3% gain in efficiency. To obtain these low heat rates a conventional plant would have to resort either to 1,100F steam at 2,400 lb pressure, or go to 3,500 psi in the 1,000/1,050F range.

A prediction that by 1965 more than 50% of all high-pressure boiler feed pumps purchased would use high pump speed was made by I. J. Karassick and E. F. Wright, Worthington Pumps. Some 60 such pumps are in services, six pending operation and 23 in production. In no case has trouble been attributable to the higher operating speed or higher stage pressures. But they conceded that the higher-speed pumps still have to prove by the calendar that life expectancy, between overhauls, is equal to or better than that of conventional pumps.

Reports of experience with boiler feed pumps driven from main turbine-generator shafts, through fluid couplings, were offered by R. D. O'Neil, American Standard, Industrial Division. By January 1961 seven installations have accumulated 33,000 hr of operation without an outage chargeable to the main-shaft-drive concept. O'Neil said there are 32 in service or on order for main shaft drive applications on 22 units.

Pump-Storage Dominates Peaking Discussion

The pumped storage concept has greatly expanded the possibilities of using hydroelectric equipment for peaking operations and reserve service, either floating or standby. And the considerations of these possibilities led Union Electric Co to build its 350-Mw Taum Sauk recirculating pumped-storage project.

This project, according to George Gamble, will result in substantial savings as against coincident installation of a 350-Mw steam unit.

Gamble noted, however, that because Taum Sauk proved advantageous is no criterion for judging other

Many Generation Types and Patterns Will Be

pumped-storage projects. It seems probable, he said, that pump-storage will be more difficult to justify on any given system as the size of steam units increases and manpower requirements per kw decline.

Duke Power Co has studied use of pump-storage for the fourth unit at its 350-Mw Cowans Ford hydro project (see EW, March 20, p 62), but found the prospects doubtful, C. T. Wanzer disclosed. For the distant future, however, several sites along the Catawba River could be developed as pump-storage projects, he said.

55-Mw Outdoor Gas Turbine Plant Unveiled

A two-unit NEMA-rated 55-Mw outdoor gas turbine plant for peaking or base load service was unveiled by H. A. Carlson and W. D. Marsh, General Electric Co. The generators are of conventional design, but feature open-ventilated construction to conserve cooling water. The authors forecast that base load use of gas turbines in combined cycle installations will help to reduce the fuel component of energy cost.

Six years of development work in diesel peaking equipment were summarized by F. W. Walker, General Motors, in these terms:

- Installed cost has been reduced from $175 per kw in 1954 to $100 in 1960.
- Heat rate has been cut from 11,300 Btu per kwhr to 10,100 Btu per kwhr
- The rate of loading the unit has increased from 1.3 Mw per minute to 5.0 Mw per min.
- From a reliability factor of 98% in 1954, the 4,200 kw unit has posted a proven annual reliability factor of 99.15%

Nuclear Reactor Progress Evaluated

Status reports on gas-cooled, boiling water, and closed-cycle water reactors found authors agreed that most major problems in reactor technology involve materials. Economic feasibility of large reactors in high fuel cost areas was generally conceded.

T. G. LeClair, General Dynamics Corp, said that the challenge of the 60's in nuclear power is one of making plants simpler, more efficient, and less costly. Meanwhile, progress toward competitive power is made by:

- Increasing the power density of the nuclear core.
- Increasing steam pressures and temperatures.
- Lowering fuel costs through (a) simplified cladding and (b) greater burnup of uranium fuel to provide longer fuel life.

LeClair cited a survey among 40 utility leaders, manufacturers and nuclear scientists predicting that in ten years the cost of fossil fuels will climb 12.9%, while nuclear fuels drop 9.4%. The survey predicted that 4% of all generation additions made in 1965 will be nuclear; in 1970 about 10%, and in 1980, 25%. These estimates would mean a total of 1,400,000 kw of nuclear capacity by 1965, perhaps 5,000,000 kw by 1970, and 45,000,000 kw by 1980.

Regarding safety in nuclear power plants, LeClair said: "I firmly believe that with a realistic attitude towards safety, nuclear power plants can be simplified in design and can be built reasonably close to large population centers. This will be one more step toward economic power."

High temperature, high-fuel-burnup, gas-cooled reactors appear to hold great promise. The HTGR system has the ability to use pressures and temperatures of 1,450 psi and 1,000F to attain net thermal efficiency of 40%. These features, coupled with high-power density and the use of conventional materials, lead to reasonable capital costs for large units. Fuel costs for 300 Mw and larger sizes are expected to be in the range of 1.2 to 1.7 mills per kwhr, according to Peter Fortescue, T. G. LeClair and C. L. Richard of General Dynamics.

The major developmental problem with HTGR has been the achievement of high-performance fuel. This problem has embraced development of highly impermeable graphite and fuel compacts containing uranium and thorium carbide.

Experience with boiling water reactors in the next two to four years will confirm both their technical and economic status, said R. B. Richards, GE. Only three completed boiling water reactor plants exist, but there will be 12 with a combined capacity over 500 Mw when stations now under construction begin operation. He estimated that a 300-Mw single-cycle plant can be built today for $197 per kw including land, interest during construction and engineering. With current technology. fuel cycle costs will be no higher than 2.5 mills per kwhr for the first core decreasing to 2.2 mills for the second and reaching 2.0 mills for subsequent cores.

Of all reactor types, closed-cycle water reactors today represent the greatest depth of both technology and operating experience, J. W. Simpson, Westinghouse, said. But improved reactor technology is needed to reduce costs. Like many machines, reactors are limited by "hot spot conditions." These include fuel element central temperatures, cladding temperatures, coolant temperature, and fuel burn-up limits, all of which are directly related to materials. As the ratio of hot spot to average condition is reduced, unit ratings can be raised, fuel fabrication cost cut, burn-ups increased and higher steam temperatures will become economic, he said.

Computers Playing Many Roles Today

Automation is progressing rapidly in power plants and system planning, and may achieve the even wider horizons of complete system operations. Beyond use for start-up, shut-down, and control of units, H. J. Fiedler and L. K. Kirchmayer, GE, visualize an over-all system of computer control which would plan, control, and account for operations automatically. Such a system computer, a self-learning model, would forecast hourly system load, initiate start-up, and shut-down of units through the unit computer, and process system and unit statistics. It would dispatch kilovars as well.

Most large companies today are weighing use of control computers for their next unit, said B. L. Lloyd, J. W. Skooglund, and D. M. Sauter, Westinghouse.

In Tomorrow's Systems

To guide such automation studies, they presented an example of the economics of automating a 325-Mw unit.

As one progresses towards complete digital computer control, sensors and actuators increase twofold while recorders virtually drop out of the picture to be replaced by increasingly complex computers, they said.

A data logging and computer system, installed on six existing units of Boston Edison's Mystic Station, was justified by net annual operating savings of $214,000, said M. J. Feldmann and J. W. Purssell Jr. Savings in manpower and fuel represented a return of 22.8% of the $941,000 project cost. Heat rate calculations assume consistent fuel content. A weekly average of fuel analysis is fed to the computer.

Considerable progress in automating system planning, technical and economic, has been made in the past year. Compatible programs in distribution, transmission, and generation planning use system data in the same form. They produce outputs suitable as inputs to other programs. And they are in a form that can be progressively incorporated into a single over-all system planning program, C. Concordia and F. J. Maginniss, GE, said.

Results of a year of planning by simulation suggests that transmission costs can keep units larger than 1,000 Mw from being economical, said C. J. Baldwin, Westinghouse. Cutting forced outage rate from 2 to 1% on new units is worth about $4.80 per kw. Peaking saturation of 20 to 25% is justified if gas turbines cost $102 per kw and older units are retired, he said.

Traveling waves, hitherto analyzed by graphic methods or by test on model systems, can now be solved by digital computers in a method developed by L. O. Barthold and G. K. Carter, GE. Separation between lightning arrestors and protected equipment, transient voltage caused by switching operations, and recovery voltage resulting from fault interruption are among problems that can now be solved digitally.

Automatic logging of ac network analyzer data will provide results in familiar form with newly developed equipment, said R. E. Gilbreath, Westinghouse. Readout is in percent voltage, per unit current and actual power; printout is directly on a single line diagram of the system.

New Theory of RI Generation Offered

A new theory on generation of radio noise on high voltage transmission lines was introduced at the EHV sessions. Substance of the theory, advanced by S. B. Griscom, Westinghouse, is that radio noise is principally caused by aerosols coming within the strong electric field regions immediately surrounding energized conductors. Griscom has found that presence of aerosols increases local electric field intensity three to 50 times above what it would otherwise be.

Radio interference design factors for EHV lines were analyzed by R. J. Mather and E. H. Gehrig, BPA. They observed that the margin between operating voltage and critical corona onset voltage is nearly a constant value (50 kv) at 230, 287.5 and 345 kv for smooth conductors. But they also found that when conductor surface is degraded, this margin between operating voltage and critical corona onset voltage decreased sharply particularly at 345-kv level.

Improvements in restrike performance of circuit breakers and in modern core steels and transformers have minimized the concern over switching surges, I. B. Johnson, R. F. Silva and D. D. Wilson, General Electric, reported. They concluded that when lines with and without terminations are energized, maximum transient voltages of 2.8 to 3 per unit may be encountered with sequential closing of breakers. The surge voltages

(*Continued on page* 106)

40 Years of Steam Plant Progress

(1960 vs 1920)

	Breed Plant (1960)	Windsor Plant (1920)	Ratio Breed : Windsor
Size of Boiler (Mw)	500	7.5	66.7 : 1
Size of Turbine (Mw)	500	30	16.7 : 1
Steam Pressure at Throttle (psig)	3,500	230	15.2 : 1
Temperature at Throttle (F)	1,050	650	1.6 : 1
Btu per kwhr Net Generation (Design)	8,550	19,000	0.45: 1
Thermal Efficiency (%)	40.0	18.0	2.2 : 1
Men per Mw	0.17	2.24	
Mw per Man	5.9	0.45	13.1 : 1
Btu per kwhr Net Generation	8,550	19,000	0.45: 1
Fuel cost—¢ per MBtu	18.70	15.35	1.2 : 1
Fuel cost—Mills per kwhr	1.60	2.92	0.55: 1
Capital cost—$ per kw	144	94	1.5 : 1
Capital cost—Mills per kwhr (14%, 7,000 hours)	2.88	1.88	1.5 : 1
Operation & Maintenance —Mills per kwhr	0.29	1.62	0.18: 1
Total Cost on Feeders —Mills per kwhr	4.77	6.42	0.74: 1

Wage, Cost, and Price Changes

(1960 vs 1920)

	1960	1920	Ratio 1960 : 1920
Electric Utility Average Annual Wages	$5,756	$1,432	4 : 1
Coal Miner's Hourly Wages (¢)	324	84.5	3.8 : 1
Handy-Whitman Utility Construction Cost index (1911=100)	677	206	3.3 : 1
Wholesale Price Index (1947–1949=100)	119.6	100.4	1.2 : 1
Consumer Price Index (1947–1949=100)	126.5	85.7	1.5 : 1
Average Total Revenue per kwhr (¢)	1.69	2.81	0.60 : 1
Average Residential Revenue per kwhr (¢)	2.47	7.45	0.33 : 1

Insulation Breakthrough Yields All-Synthetic 345-Kv Cable

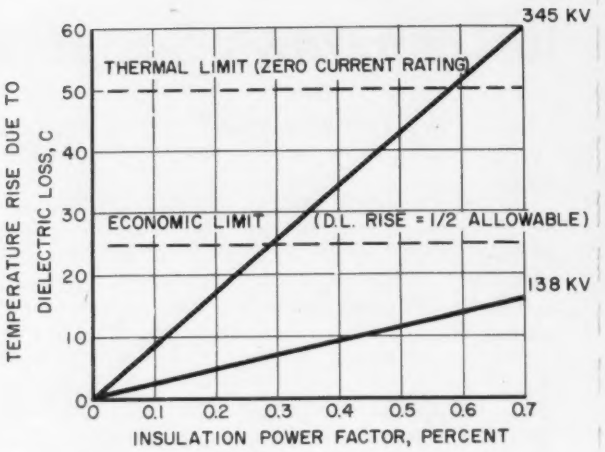


FIG 1—TEMPERATURE RISE due to dielectric loss (DL) for representative 138-kv and 345-kv power cables

New EHV cable insulated with polycarbonate resin tape and ultra-thin synthetic oil has dielectric losses less than one-quarter those of 345-kv impregnated-paper cable

L. F. HICKERNELL, Vice President—Engineering,
E. D. EICH, Asst Chief Engineer—High Voltage Cable,
Anaconda Wire & Cable Co, Hastings-on-Hudson, N. Y.

Increasing utility loads coupled with greater urban congestion point today to an accelerating trend: More insulated cable at higher voltages! Almost every major utility has new plans on the drawing board, if not actual construction under way, to add new circuits to their high voltage (60-138 kv) underground cable systems. The largest are seriously looking at EHV (230-345 kv) cable. Among these, Con Edison of New York has announced plans for a 345-kv, 17-mile circuit that will be in service in 1964 or 1965.

Major motivation for higher voltage underground cable is the same as for overhead lines: More power per circuit. While a 138-kv pipe cable can carry 180-200 Mw, a 345-kv cable can carry about 450-475 Mw. Since the costs of trenching, cable pulling, etc. increase only slightly with cable size, there may be real economy in going to higher voltage insofar as the cable itself is concerned.

The "Cornell Project" (EW, Oct. 10, 1960, p 50) was instituted when it was found that a number of US utilities were considering 345-kv cable. The project is designed to evaluate the long-term behavior of several types of 345-kv cables under field conditions of installation and operation.

The all-synthetic cable described here was developed as a radically new answer to this demand for a 345-kv high-power cable. This breakthrough in EHV cable, as we see it, has demonstrated four significant facts:

1. An entirely synthetic insulating oil is practicable, has been proven in long-time aging at high stress, and offers advantage in lower losses.

2. A synthetic-film cable, "impregnated" with thin oil can, in fact, be produced (contrary to many speculations) and operated up to at least 500 kv 3-phase.

3. Use of all-synthetic insulation reduces dielectric loss to less than ¼ that of excellent impregnated-paper cable, with resultant substantial increases in power handling capability.

4. The principle of the "Garton Effect" indeed does operate in full scale cables; hence the dielectric properties of EHV cables are not predictable from conventional data.

The use of extra high voltages introduces several problems. In cable, one of the major ones is dielectric loss. While dielectric loss is an economic loss, analogous to transformer core loss, the greater problem is a technical one: The temperature rise generated by the dielectric loss (DL)! At best, this temperature rise cuts into the current rating; at worst, the allowable temperature rise may even be exceeded by the DL rise alone, destroying the cable. (See Fig 1.)

Since the dielectric loss is given by:

$$DL = K\ E^2 \times \tan \delta \times SIC$$

where DL = dielectric loss in watts per ft
K = constant accounting for geometry and units
E = operating voltage
tan δ = power factor (dissipation factor) of insulation, percent
SIC = dielectric constant of insulation, dimensionless

There are two obvious conclusions:

1. The dielectric loss (DL) problem goes up with the square of the voltage; thus at 345 kv it is 6¼ times worse than 138 kv. This is reflected in Fig 1.

2. The only parameters the cable designer can look to for improvement in dielectric loss are power factor and dielectric constant.

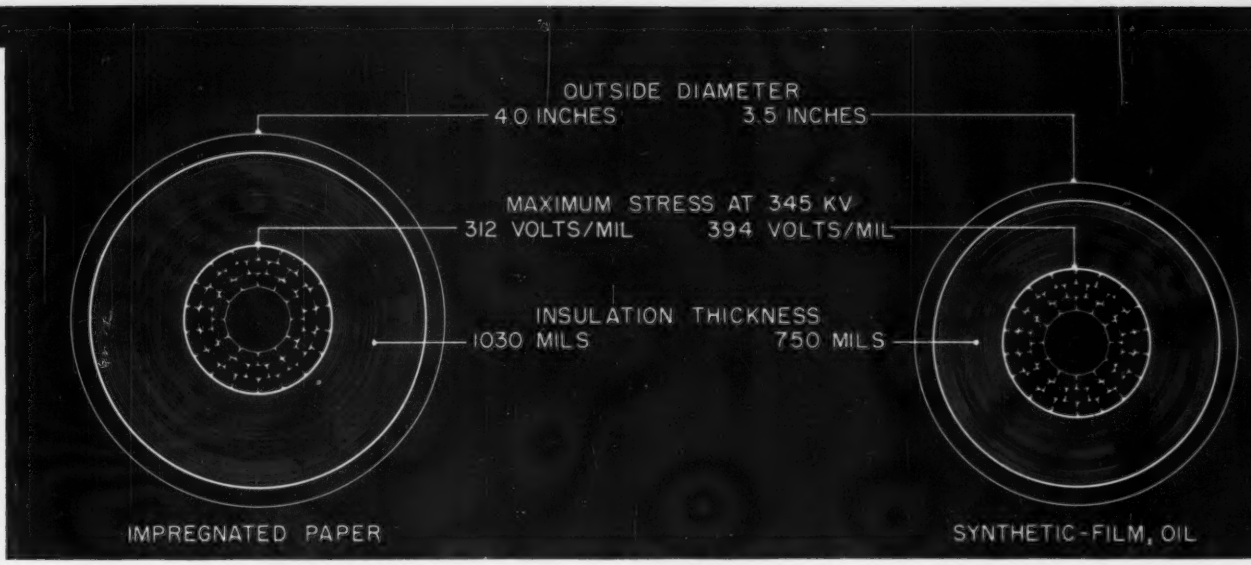


FIG 2—345-KV CABLES COMPARED: The all-synthetic EHV cable at right has 25% less insulation thickness than the impregnated paper cable construction shown at left, and the dielectric losses are less than ¼ as much

For a variety of reasons, the only insulation satisfactory for EHV insulation has been oil-impregnated paper. Much effort has been devoted to reducing the power factor of paper insulation, and great progress has been made. But research and development people generally agree that we've about come to the end of the line with paper and oil. Specially-treated pulps, paper-making with de-ionized water, improved manufacturing of paper giving better formation at lower densities than previously possible, special oils carefully purified—these all help. In fact, they make 345-kv impregnated-paper practicable. However, even the best of *new* cables show a power factor of about 0.20 to 0.25% at operating temperature. This leaves very little margin for error or deterioration before climbing up the DL—temperature curve to uneconomic levels.

For years engineers have been dreaming of a real technical breakthrough, a reduction in power factor of 50% or so to 0.15% or even 0.10%. Now it has been done!

Insulation Barrier Broken

After a thoroughgoing study of the intricacies of the problem and the possible routes to explore, Anaconda engineers in cooperation with scientists from A. D. Little, Inc, of Cambridge, Mass., became convinced that an entirely synthetic cable could be designed and manufactured.

Considerable theoretical work showed that by appropriate design, a cable could be made which could exploit a peculiar phenomenon of impervious films "impregnated" with oil, that is popularly known as the "Garton Effect" (after C. G. Garton who first published the mathematical theory: J. Inst. of Elec. Eng., *88*, II, 103-120 [1941]). Roughly put, this theory says that the power factor of an impervious-film, oil combination can be much less than either component, if the oil film between tapes is of certain dimensions, selected according to voltage stress, viscosity, etc.

The new 345-kv all-synthetic cable uses one of the new polycarbonate resins which has been cast

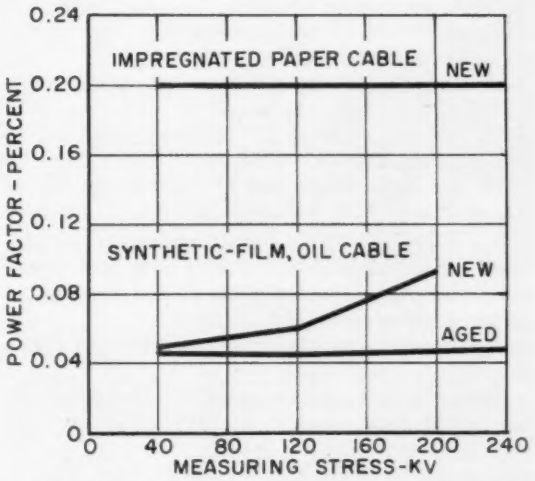


FIG 3—POWER FACTOR vs STRESS curves for all-synthetic cable shows 75% reduction in power factor over EHV test range after aging, vs new paper cable

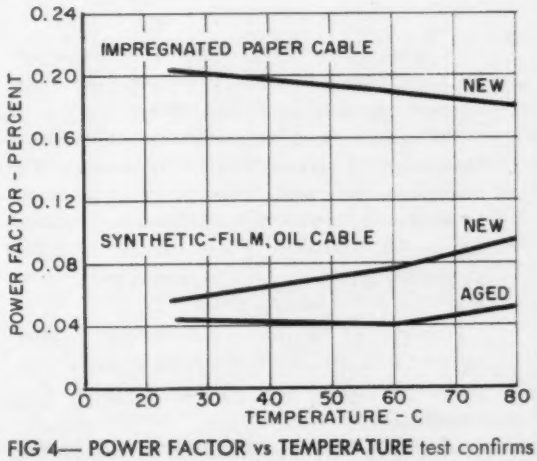


FIG 4— POWER FACTOR vs TEMPERATURE test confirms reduction of power factor from 0.20% for paper cable to 0.05% for aged all-synthetic cable at 75C

as film and slit into tape form. The tapes have a special embossing pattern which permits vacuum treatment to remove residual solvents from the film and adsorbed moisture and air. The cable is "impregnated"—the inter-film spaces are filled—with an ultra-thin, very low viscosity special oil. Anaconda compounds this oil itself, starting with a fully-hydrogenated synthetic polybutene base and using certain pure chemicals as additives.

Design Uses Garton Concept

The concept of Garton is followed by having the oil viscosity low and the inter-tape film thickness low, so that under EHV stresses the ionic impurities traverse the oil film in less than one-half voltage cycle.

The resultant cable exhibits an unusually high dielectric strength owing to the imperviousness of the tape and thorough impregnation. Such a cable can be operated at substantially higher stresses than a "conventional" impregnated-paper cable. In Fig 2 an impregnated-paper cable and the synthetic-film, oil cable are shown. Both are 345-kv cables. Note the lesser insulation thickness—a 25% reduction—and corresponding diameter decrease.

In 1958 the full-scale commercial cable, shown in Fig 2, was made and placed on long-time cyclic aging test to determine its behavior under actual and accelerated service conditions. Since then the cable has been under test at successively higher temperatures and voltages ultimately reaching $500/\sqrt{3}$-kv and 120C average conductor temperature. Characteristics of the cable have been extensively measured each step of the way to observe any deterioration or instability.

A sample of the test results is shown in Fig 3 and 4.

From Fig 4 it will be seen that a breakthrough has indeed been achieved in EHV cable. At 75C the synthetic cable has a power factor of about 0.05% compared to about 0.20% for the lowest anticipated figure obtainable on a paper cable: An impressive 75% reduction!

This reduction in losses can be evaluated in two ways: higher current ratings and lower system losses. Assuming plausible parameters for a 345-kv pipe cable installation, the elimination of ¾ of the losses in the dielectric frees about 15C for increased current rating. This means that a synthetic cable can carry about 110,000 kva more than an equivalent paper cable. Moreover, a synthetic cable in a 17-mile line would have about 350 kw (and 2½ million kilowatt-hours per year) less loss, and the cable would operate about 15C cooler, for equal currents, resulting in longer life.

Has Other Advantages

The cable has other advantages such as smaller diameter, lower dielectric constant, and less susceptibility to moisture. Although the first cable manufactured was of the low-pressure oil-filled type, exactly the same dielectric benefits are expected in pipe cable.

At present there is no application for a synthetic cable at 138 kv and 230 kv because the losses in paper cable at such voltages are economically and thermally tolerable.

The synthetic cable is not ready for commercial production as yet, awaiting sufficient growth in the market for EHV insulated cable to warrant solving the manufacturing problems involved in switching to synthetic films.

Speculating about still higher voltages, we are of the opinion that theoretically a 700-kv cable is feasible based on the present technology. However, considerable work would be necessary to overcome manufacturing difficulties. Also remaining are other problems involving joints and terminals.

What Are Polycarbonates?

In brief, polycarbonates are general-purpose electrical resins with a balance of properties which appears attractive for power cables.

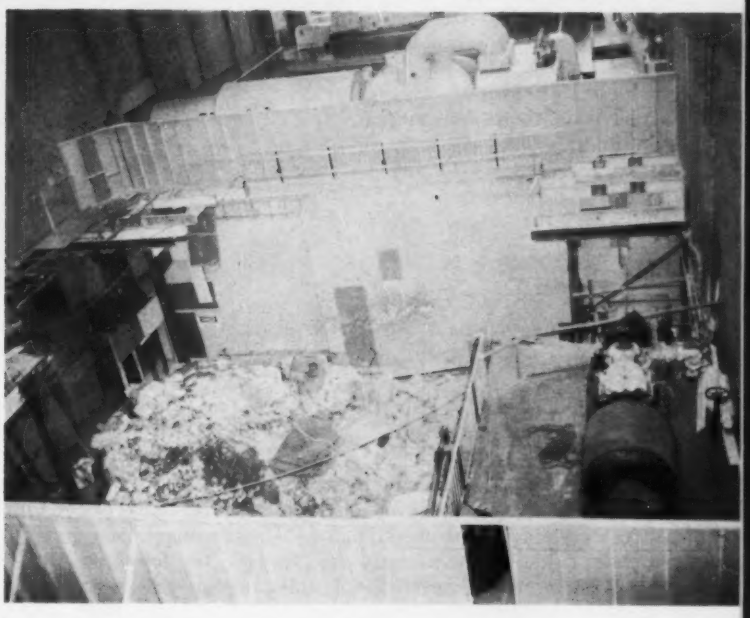
The generic term "polycarbonate" identifies a large family of plastics. The first commercial polycarbonate resins were linear polymers prepared by condensing bisphenol-A with carbonyl chloride (phosgene). However, a vast number of other polycarbonates have been prepared using other chemicals as the starting points.

Properties of the various polycarbonates differ according to the basic chemical structure and method of manufacture, molding, extrusion, casting, etc.

Generally, however, the polycarbonates possess high tensile strength (9,000 psi), good heat resistance (softening above 140C), and good dimensional stability. They are, in other words, hard, tough plastics.

Electrically, polycarbonates have high dielectric strength (3,000 volts/mil), high insulation resistance or volume resistivity (10^{16} ohm cm), low dielectric constant (3.1), and reasonably low power factor (0.1% at 100C). In a laminated structure (sheets or tapes), filled with oil, the composite electrical properties may be quite different from the properties of the components. For electrical applications, therefore, some prototype evaluation may be necesary. This would be true for any similar impervious film.

PRECISION BLASTING of old generator is achieved in small bites to prevent shock, vibration and/or dust damage to the adjacent operating generator



Precision Blasting Saves Time, Cuts Cost

An old generator foundation at Moores Park Power House was recently removed for the Lansing Board of Power & Light by precision blasting techniques without interference from shock, vibration or dust, to the turbogenerators operating nearby. Furthermore, the demolition and removal of the old foundation was completed by the Michigan Blasting Co, of Trenton, Mich., within two weeks, at one third the cost of more conventional methods.

The turbogenerator foundation removed was approximately 30 ft wide, 50 ft long and 30 ft above the ground floor. In addition, it extended about 10 ft below the ground floor, to sit upon several large caissons, which in turn extended down to bedrock. The total foundation to be removed amounted to about 350 cu yd of heavily reinforced bulk concrete above grade and about 250 cu yd of the same, below grade.

Rigid working specifications controlled the demolition job:

- The amplitude of blast-induced shock-vibration could not exceed 75 mils, as measured on the vibrometer on the operating turbogenerator—30 ft away.
- Dust had to be held to a minimum to prevent damage to instruments and equipment in adjacent areas.
- No scattering or throwing of chunks of concrete beyond the narrow confines of the old generator room could be tolerated.

First, in order to contain and thereby minimize dust which could be carried to adjacent work areas, a rocklath partition was erected on the two open sides of the old generator room.

Then, the actual work of foundation demolition was divided into four stages: three stages for the portions of foundations above the ground floor and one stage for the foundation section below ground floor—that is, the total of the concrete foundation to be removed was attacked in 10-ft sections. Each 10-ft section was demolished and carted away as a separate task.

The demolition of each section was achieved by first drilling a series of ¾-in. x 6-in.-deep, precisely located holes . . . three to four to a group. The holes of a group were then each loaded with about 1½ lb of dynamite. A delayed blasting cap was used to set off the charges. For each blast, approximately 5½ million ft-lb of energy was expended.

During the drilling of the blast charge-holes, water heads were used on the drills to minimize the dust. Also, for each blast, rope mats were used atop the charges to contain the effects of the blast.

Michigan Blasting Co has previously demolished four similar foundations for the Cleveland Electric Illuminating Co, Cleveland, Ohio. While extensive outside demolition work, such as blast demolition of old stacks and obsolete buildings, is still being done by MBCo, 75% of its work is now accomplished inside buildings where only a few years ago such blasting was considered too dangerous.

MI Cable in Floor Heats Substation

Commonwealth Edison Co has installed mineral-insulated (MI) cable to heat the concrete floor slab of the control building at Hegewisch Transmission Substation. This is one of several installations of floor-slab heating which the company has made to provide more information on off-peak heating possibilities. A previous installation (EW, May 13, 1957) used reinforcing rods in the concrete as the heating elements.

MI cable was selected to obtain information on:

1. Problems encountered during installation and operation.

2. Cost of similar installations.

3. Use of cable formulas in calculating conductor temperature rise.

The insulation's resistance to damage by expansion and contraction of concrete with temperature changes was considered in the selection of MI cable. Installation presented no particular difficulties, and costs were less than estimated. Test results indicate that cable formulas may be applied to determine cable lengths required for installations of this type.

HEATING CABLES of two-conductor No. 16 copper, mineral-insulated, are attached to reinforcing rods with tie wires

However, adjustments in values of concrete thermal resistivity may be needed to compensate for metal reinforcing in the concrete slab.

The control room is a one-story detached building having 650 sq ft for floor area and a volume of 7,000 cu ft with an unheated cable space under the floor. Space for heating cable installation and for heat storage was reduced to 570 sq ft by floor openings.

Substation walls are brick, 12-in. thick. The floor is of 6-in. concrete, equivalent to a 1:2½:4 mix with 2 in. of wood-composition board insulation. The roof is of the built-up type over 3-in. precast concrete slabs with 2 in. of foam glass insulation.

Heating requirement of the building was calculated at 15 kw at 60F inside air temperature, —10F outside, and a 15-mph wind. For this requirement 10 kw of heating was installed as MI cable, and a 5-kw unit heater also was provided.

The floor heating element consists of two No. 16 wires (conductor grade) in a copper sheath insulated with magnesium oxide. A circuit consists of a suitable cable length with conductors joined and insulated at the remote end. At the supply end a length of similar cable with No. 6 conductors is joined to the No. 16 conductors to form a "cold" lead. Cable length is selected so that at the available voltage of 120 v the conductors will be sufficiently loaded to produce enough heat. The heating value was calculated from the nominal resistance of the two conductors at 20C.

Heating Cable Length Calculated

The required heating cable length was calculated at 300 ft per circuit with two circuits operating. Cables were spaced 9 in. apart and installed in 450 sq ft of floor area. In the final design cable resistance was recalculated at operating temperatures to determine more accurately required cable length and spacing.

Cables were arranged in parallel runs with loops at the ends and were attached to floor reinforcing rods with iron tie wires. At the termination conductors were twisted and silver soldered; at hot-cold junctions they were spliced and silver soldered. Terminations and connections were made below the finished floor level and were sealed in epoxy resin.

The heating cable is energized through a two-pole contactor controlled by two 20F-90F thermostats. Thermostat bulbs are in floor wells. One thermostat, set at 85F, acts only to limit floor surface temperature. The other has a setting and is inserted in one of three floor wells so that floor temperature can be varied with changes in outside temperature. The 5-kw unit heater is controlled by a room air thermostat.

Performance of the system has been highly satisfactory. It has exceeded expectations in regulating indoor temperature, even at very low outside temperatures that are occasionally encountered.

commercial cooking...

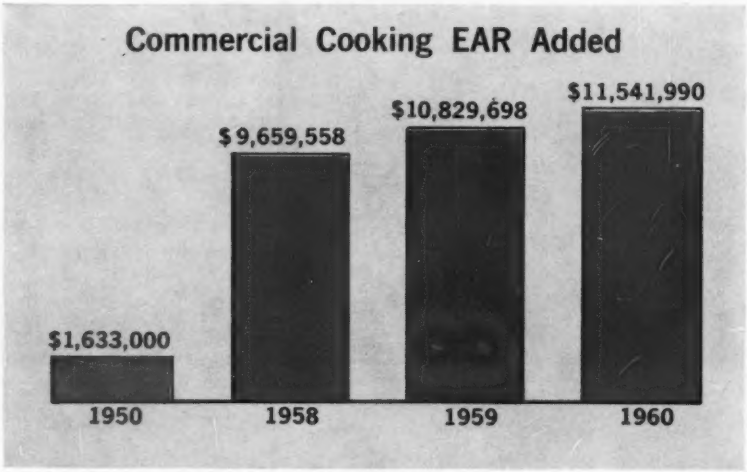
Rolls With the Economic Punches; Load Is Up Despite Some Setbacks

- Total cooking kw added in 1960 was 461,170 kw at 74 surveyed utilities, or an average of 6,905 per company; a jump from 455,971 in 1959
- Earnings were also up. Companies surveyed added $11,541,990 in commercial cooking EAR in 1960.
- But 29 utilities were down in load added last year; three companies—Southern California Edison Co, Commonwealth Edison Co, and Pennsylvania Power & Light Co—accounted for 20% of total kw added

John D. Damon
Assistant Editor

commercial cooking...

There were 11,526,000 commercial



Commercial electric cooking has been rolling with the economic punches but showed plenty of fight in 1960.

This last recession hit several utilities in their commercial cooking sales as it did in many other areas but now that things are looking brighter, commercial cooking too is back in the center of the ring, ready to continue the battle.

There are three reasons why commercial cooking at some utilities did not do as well last year as in previous years. There are also three parallel reasons why it is gearing for the comeback.

The reasons:

1. A slowdown in new construction on non-residential buildings.
2. The recession.
3. Utilities put more emphasis on other forms of commercial load last year.

The comeback will be assured by:

1. An uptrend has already been noted in new construction.
2. The recession is bouncing back.
3. Those companies which increased their commercial cooking sales expenditures and promotional efforts showed good, steady results.

These results were uncovered in the Sixth Utility Commercial Cooking Survey conducted by the commercial equipment department of the General Electric Co which surveyed 74 representative utilities engaged in the promotion of electric cooking load. This is up two from the number answering the last survey (EW, April 18, 1960, p 75-82).

It is significant that in each survey, and this is the sixth *Electrical World* has published, more utilities showed an interest and results in commercial electric cooking, and each year gains were impressive enough to indicate that commercial cooking is becoming, and will become, even more an important part of the commercial load.

The 1960 survey covered 188,008 food service customers, approximately 33% of the 565,000 industry total, and 1% over last year.

Total cooking kilowatts added in 1960 were 461,170, up from 455,971 in 1959. This is an average of 6,095 kw per company, compared with an average of 6,333 kw in 1959.

What this survey showed then is that while total load is up certain companies are hard selling the bulk of the market.

Three companies, Southern California Edison Co (38,502 kw); Commonwealth Edison Co (31,152 kw); and Pennsylvania Power & Light Co (22,429 kw), or a total of 92,083 kw, accounted for 20% of the 461,170 kw added in 1960.

The same three companies accounted for 39.8% of the 231,621 kw added by the 16 companies in their division.

Although only 39 companies last year showed an increase and total load was up, 29 were down, and six did not answer that question for 1959 and therefore a comparison cannot be made.

The 39 companies who were up last year added 268,390 kw compared to 230,814 in 1959. The 29 that were down only had 178,485 kw in 1960 as compared with 211,857 kw in 1959.

Investigating the possible reasons for the downtrend noted on the part of the 29 companies discovers that it could be the recession (Pennsylvania Power & Light Co was down 11,000 kw from last year and it is in a recession-hit area); a trend to vending machines in factory employee feeding, (industrial kitchens were down from 7.1% in 1959 to 6.1% in 1960); and a slowdown in new construction on commercial buildings (electric cooking

cooking kw nationally by end of 1960

Load Analysis – 1960

Commercial Cooking Load Derived From		
New construction	229,662 kw	49.8%
Remodeling	83,011	18.0%
Replaced Gas	70,098	15.2%
Replaced Electric	26,287	5.7%
Expansion	52,112	11.3%

Market Analysis – 1960

Commercial Cooking Load Derived From		
Restaurants	226,896 kw	49.2%
Hotels-Motels	38,738	8.4%
Schools	85,316	18.5%
Hospitals	36,432	7.9%
Industrials	28,132	6.1%
Miscellaneous	45,656	9.9%

was down from 67.6% in 1959 to 49.8% in 1960).

However Dr. Pierre Rinfret, director of economics department at Lionel D. Edie Co, told the Edison Electric Institute 27th Annual Sales Conference "This is it, the recession is over! By the end of 1961 we will be smashing new economic records."

This, therefore, will portend good for the commercial electric cooking conscious companies who are looking to increase this load in 1961.

Commercial electric cooking has been growing steadily over the years (see chart, p 66), and there is nothing on the horizon to indicate that this growth will not continue.

Survey Reflects Increasing Growth Trend

An increasing growth trend in commercial cooking revenue was reflected in the survey. Surveyed utilities added $11,541,990 in commercial cooking EAR in 1960. In 1959, $10,829,698 was added, and $9,659,558 in 1958. The estimated annual revenue added in 1950 was $1,633,000.

The estimated total commercial cooking kw of the reporting companies in 1950 was 777,626. In 1953 it was 1,140,988 kw. But by 1960 it had jumped to 3,848,858 kw. This gives a national average of 20.4 kw per customer.

There were, therefore, an estimated 11,526,000 commercial cooking kw nationally by the end of 1960.

Whereas the greater percentage of added load still comes from new construction, the figures show a marked decrease from 1959. That year the utilities reported an average of 67.6% devoted to new works. In 1960 the figure was 49.8%.

Of its total new load of 55,527 kw added in 1960, Division I utilities put 46.4% or 25,765 kw into new construction, 17.7% or 9,828 kw into remodeling.

In Division II, 46.8% (28,784 of 61,505 kw) went to new construction, and 19.3% (11,870 kw) into remodeling. Division III reported that 60,759 of 112,517 kw—54%—went to new construction and 18.7% (21,041 kw) went to remodeling.

The big companies in Division IV indicated they received 120,906 kw (52.2% of 231,621 kw) from new construction and 37,754 kw from remodeling.

Philadelphia Electric Co got 80% of its commercial cooking load in 1960 from new construction. Southern Berkshire Electric Co got 50% of its from remodeling. Ohio Edison Co derived 70% of its load from replacement of fuel equipment. Idaho Power Co and Washington Water Power Co derived 20% each from replacing old electric equipment and Consolidated Edison Co added 42% of its commercial cooking load from equipment which was added to expand operations.

Into what type of establishment did the equipment go? Well, restaurants increased their share of the market going from 46.7% in 1959 to 49.8% in 1960. Hotels and motels accounted for 6.3% of the market in 1959 and 8.4% in 1960. The increase in motel building was a big reason for this.

Schools dropped 0.5% in 1960. They accounted for 19% of the market in 1959, and 18.5% in 1960. Industrial load building dropped one point from 7.1 to 6.1%. The remainder of the 1960 load, 9.9% went into miscellaneous establishments.

All of the commercial cooking load at Southern Berkshire Electric Co in 1960 was derived from commercial restaurants. Houston Lighting & Power Co had the largest load in hotels and motels, 35%, while Northhampton Electric Co derived 60% of its 1960 load from school cafeterias.

Hospitals gave Toledo Edison Co. 39% of its

All-electric kitchens increased

Kilowatts Per Customer

Division I

Company	Kw Per Customer 1960
Knoxville Utilities	19.16
Idaho Power	8.88
Minnesota P&L	6.22
Nashville Electric	4.50
Merrimack-Essex	4.18
Weymouth L&P	4.00
Potomac Edison	3.75
Washington Water Power	3.37
El Paso Electric	3.25
Suburban Electric	3.06

Division II

Company	Kw Per Customer 1960
Central P&L	8.81
Seattle Dept Of Lt	6.37
Toledo Edison	4.37
Southwestern EP	3.80
Atlantic City Electric	3.24
Mississippi P&L	3.13
Utah P&L	3.11
Wisconsin PS	2.71
Indianapolis P&L	2.68
Kansas G&E	2.65

Division III

Company	Kw Per Customer 1960
Texas P&L	6.43
Portland GE	4.36
Carolina P&L	3.06
Jersey Central P&L	2.66
West Penn Power	2.61
Gulf States Utilities	2.56
Florida Power Corp	2.53
Oklahoma G&E	2.51
Pennsylvania Elec	2.40
New York State E&G	2.30

Division IV

Company	Kw Per Customer 1960
Appalachian Power	4.55
Virginia Elec Pwr	4.18
Pennsylvania P&L	3.75
Duke Power	3.62
Ohio Edison	3.50
No. States Power	2.92
Commonwealth Ed	2.61
So. Cal. Edison	2.55
Georgia Power	2.30
Detroit Edison	1.88

commercial cooking load, while Potomac Electric Power Co got 22% of its load from industrial establishments.

Lynn Gas & Electric Co derived most of its cooking load last year from miscellaneous, 54%.

This year's survey differs from previous ones not only in revamped questions but in a new classification of divisions.

This survey was broken down into four main groups:

Division I—Less than 150,000 meters
Division II—150,000-250,000 meters
Division III—250,000-475,000 meters
Division IV—Over 475,000 meters

The new divisions permitted an average of 16 companies in each category, with the exception of Division I which contained 27 small utilities.

The companies in the smallest division averaged 781 food service customers. Those in Division II averaged 1,259; Division III served an average of 2,981 customers, and the giants in Division IV averaged 6,348 apiece.

A similar ratio was revealed in the number of commercial cooking kilowatts added in each division. Division I added an average of 2,057 kw for each utility; Division II, 4,100 kw; Division III, 7,032 kw; and Division IV, 14,433 kw.

Although the number of utilities in the survey may be small compared to the number of utilities in the country, those in the survey are the leaders in commercial cooking and their results, therefore, give a true national picture of how utilities can and should handle this market.

All-Electric Kitchens Show Increase

Sixty-six of these revealed that 16,809 all-electric kitchens are on their lines, or 10.4% of their total food service customers. This is an increase from the last survey which showed 10.2%.

Food service customers with one or more electric cooking devices totaled 93,043 in 1960, with 65 companies reporting. This was up from 86,980 in 1959, and represents an increase from 53 to 57%.

This is encouraging because although all-electric establishments are not showing the increase they might, the first real wedge to going all electric is getting any piece of electric cooking equipment into an establishment.

Therefore, this increase in partial-electric kitchens portends more all-electric kitchens in the future, or at least more electric pieces in the partial-electric establishments.

Montana Power Co in Division I had 2,100 food service operators on its lines, and 500 cook all electrically and the other 1,600 cook partially electrically. In Division II, Atlantic City Electric Co had 1,800 partially electric establishments and 100

to 10.4% of total food service customers

New Load

	Division I (27 companies)	Division II (15 companies)	Division III (16 companies)	Division IV (16 companies)
New cooking load added — 1960	55,527 kw	61,505 kw	112,517 kw	231,621 kw
New load per FS customer — 1960	89.79 kw	51.34 kw	41.87 kw	39.20 kw

all electric, out of its 2,000 food service operators. Houston Lighting & Power Co and Oklahoma Gas & Electric Co led in Division III. Houston had 3,200 partial electric and 60 all electric out of 4,300 operators and Oklahoma had 2,675 partial electric and 225 all electric out of 2,900.

In Division IV, Detroit Edison Co had the largest number of partial electric food service operators (5,800), whereas Pennsylvania Power & Light Co's 6,000 operators either cooked all electrically or partially electrically, 800 and 5,200 respectively.

In 1959 the 72 companies reporting added 455,971 kw of commercial cooking load, for an average of 6,333 kw per company. In 1960, 74 companies reported adding 461,170 kw, averaging 6,905 kw per company. This increase was accomplished in spite of the fact that 29 of the top 60 companies reported less load added than in 1959, an indication of the tremendous natural growth of the commercial electric cooking industry as a whole.

Earnings per kw averaged $25.03, a marked increase over 1959's $23.40.

Sales Costs Per Dollar of Revenue Jumped

Utilities are also spending more to gain added commercial cooking revenue. The national average of sales costs per dollar of commercial cooking revenue was 24¢ in 1959, and this jumped to an average of 32¢ in 1960. Thirty companies reported spending a total of $954,698 on cooking sales.

With 30 companies reporting, the national average sales expense per food service account in 1960 was $18.41, up from $15.01 last year and $13.62 in 1956.

What percentage of a utility's total commercial budget is being used to boost commercial cooking?

In Division I, the utilities reported from 15-34% with an average of 21%. Division II was about the same with an average of 22%. In the larger divisions, however, the percentage dropped significantly confirming again that the utilities as a whole are spending approximately the same amount to gain commercial cooking revenue. Division III spent only 16% of its total commercial budget for cooking and Division IV only 12%. It must be pointed out, however, that these are averages; some utilities spent double the national average for cooking.

This year's survey investigated to find out where commercial cooking stands in the total commercial sales budget. Is more money devoted to lighting, air conditioning, water heating and other loads?

It was discovered that as in the past the greatest percentage of the total commercial budget was spent on lighting, an average of 32.9% nationwide. But commercial cooking was next in line. Utilities indicated that they spent an average of 22.6% of their commercial sales budgets on the promotion of commercial cooking.

Looming right behind, however, was space heating with 16.5%. This would indicate that while commercial cooking is not being de-emphasized, space heating has been getting more and more attention, and more money.

Southwestern Electric Power Co devoted 40% of its total commercial sales budget to cooking, while Detroit Edison Co put out 39%, and Central Power & Light Co and Dallas Power & Light Co each devoted 35% of their commercial budgets to commercial cooking.

Cooking Specialists Exposed to Training

Of 147 commercial cooking specialists employed by the reporting utilities, 109, or 73.4%, were exposed to specialized training in commercial cooking, up from 1959's 70%. In addition, the utilities reported they also trained 804 all-purpose representatives in commercial cooking. As a national average, however, this represents a decrease from 1959 when the same number of utilities reported schooling 847. In 1958 the number of all-purpose representatives trained was 1,023.

In Division I, Iowa Electric Light & Power Co had 36 all-purpose reps spending 10–15% of their time on commercial cooking. In Division II Mississippi Power & Light Co used 17 men who spent 25% of their time. Division III company Ohio Power Co had 48 men spending 25% of their time, and Los Angeles Department of Water & Power had 50 men who spent 20% of their time selling commercial cooking. Commonwealth Edison Co. had 150 all-purpose reps, but could not determine how much time they spent.

New Commercial Cooking Load Added in 1960

Division I

Company	1960 New Load	1959 New Load	Place
1. Idaho Power	7,322 kw	8,780 kw	1
2. Chattanooga EPB*	6,044	4,410	4
3. Potomac Edison	4,691	5,058	2
4. Knoxville Utilities*	4,120	3,000	6
5. Narragansett Electric*	3,663	2,400	10
6. Worcester County Elec	3,642	4,638	3
7. Nashville Electric	3,601	3,872	5
8. Minnesota P&L*	2,800	2,165	12
9. Western Mass. Elec.	2,390	2,888	7
10. Washington Water Power	2,358	2,640	8
11. Merrimack-Essex*	2,300	2,271	11
12. Omaha PPD*	1,942	1,940	13
13. New Jersey P&L*	1,309	1,282	15
14. Kentucky Power	1,250	2,422	9
15. Suburban Electric	1,224	1,348	14

Division II

Company	1960 New Load	1959 New Load	Place
1. Central P&L*	7,044 kw	6,126 kw	1
2. Seattle Dept Lt*	7,009	4,957	3
3. Atlantic City Elec.*	6,472	4,833	4
4. Southwestern PS*	5,830	5,124	2
5. Utah P&L*	4,662	4,200	6
6. Toledo Edison*	4,424	3,444	10
7. Kansas P&L	4,043	4,485	5
8. Southwestern EPB*	3,800	3,567	8
9. Dallas P&L	3,500	3,530	9
10. Indianapolis P&L	3,346	3,753	7
11. Kansas G&E	2,920	2,964	12
12. SMUD	2,660	3,043	11
13. Mississippi P&L*	2,344	2,230	14
14. Wisconsin PS	1,951	2,725	13
15. Louisiana P&L*	1,500	1,080	15

Division III

Company	1960 New Load	1959 New Load	Place
1. Carolina P&L	13,380 kw	13,909 kw	2
2. Texas P&L*	10,285	9,379	3
3. Gulf States Utilities*	10,242	8,094	4
4. West Penn Power*	7,821	7,319	6
5. Oklahoma G&E*	7,282	6,600	8
6. Pennsylvania Elec.*	7,208	7,097	7
7. Ohio Power	6,750	15,560	1
8. Pacific P&L	6,678	NA	—
9. Potomac Elec.*	6,637	4,341	12
10. Portland GE	5,860	8,075	5
11. Duquesne P&L	5,852	6,474	9
12. New York State E&G*	5,755	3,924	13
13. Florida Power*	5,139	4,837	11
14. Jersey Central P&L*	4,786	3,808	14
15. Houston L&P	4,686	5,472	10

Division IV

Company	1960 New Load	1959 New Load	Place
1. Southern California Edison*	38,502 kw	34,687 kw	1
2. Commonwealth Edison*	31,152	25,939	3
3. Pennsylvania P&L	22,429	33,615	2
4. Ohio Edison*	16,794	15,817	6
5. Detroit Edison	15,507	19,782	4
6. Duke Power	14,020	15,215	7
7. Virginia Elec. Power	13,698	12,400	10
8. Georgia Power	13,633	15,134	8
9. No. States Power*	13,450	13,058	9
10. Appalachian Power	12,738	16,932	5
11. Alabama Power*	9,072	7,190	11
12. Philadelphia Electric	8,105	NA	—
13. LA Dept W&P*	7,084	5,750	12
14. Union Electric*	5,787	5,538	13
15. Consumers Power	5,600	NA	—

*1960 showed increase in new commercial cooking load.

Free-trial devices made for easy sales

Both the number of promotional meetings and customers attending dropped sharply this past year. In 1959, 72 utilities reported they held 1,041 meetings, an average of 14 per utility. Approximately 66,000 persons attended. In 1960, however, 74 utilities indicated they held only 615 meetings, averaging about eight meetings per utility attended by a total of 45,000 customers. Individual utilities still emphasize this means to promote cooking kilowatts however.

New York State Electric & Gas Corp held one customer meeting in 1960 with a total attendance of 2,000. Kansas Power & Light Co had two meetings with 1,900 in attendance.

A definite trend to year-'round commercial cooking campaigns was indicated by the survey. In 1959, 33 companies reported year-'round campaigns. This number jumped to 41 in 1960. Next in line was the spring as the favorite time of year for campaigns, while eight companies indicated both a spring and fall cooking campaign.

Four-Pronged Promotion Backs Up Kw

Special promotions employed by some utilities achieved significant results. Ohio Power Co ran a powerful four-prong promotion with a $5/kw wiring allowance on electric fryers and griddles; a money-back guarantee for customers not completely satisfied within 30 days after installation; free service; 10% of purchase price to the dealer in the event of a customer invoking the money-back guarantee.

Ohio Power Co racked up 959 extra cooking kilowatts from 89 new customers who bought 163 electric fryers and griddles as a result of this campaign which generated sales of 301 kw from other cooking equipment.

West Penn Power Co Vice President R. W. Hurd personally directed a drive on fryers and griddles by depositing these devices in the offices of division and district managers with the crisp order, "You have 23 days to move them out of here." They did, and racked up 308 extra cooking kilowatts.

Kansas Gas & Electric Co has stirred up a highly favorable reaction among both food equipment dealer and customers by announcing in 1960 a new commercial cooking rate, without a demand charge. A new rate schedule permits electric cooking, space heating and water heating to be measured through a single meter, eliminating the demand charge. Cooking is now KG&E's biggest load builder after lighting and air conditioning.

As in the past, free-trial devices make for easy sales. Division I reported 64% of its devices on free trial were converted into sales. Division II said 80%, Division III, 57%, and Division IV, 67%.

In Division I Empire District Electric Co installed 75 free-trial devices last year and converted 75% of them into sales. Central Power & Light Co in Division II installed 337 and converted 65%. Division III company Texas Power & Light Co installed 336 and converted a phenomenal 90% into sales. Commonwealth Edison Co, Division IV, installed 1,053 and converted 75% of them.

Thirty-eight companies adapted manufacturer promotions to promote electric cooking; 13 tied in with equipment manufacturers; and 45 tailored their own. But many companies indicated they did all three.

The type of dealer incentives vary. Salesmen received cash awards (50¢ to $1 per kw), dinners, merchandise and coupons for merchandise, trips of all kinds, clothing and the like. Many utilities, however, offered no dealer incentives.

Architect Calls Are Vital

Architect calls are still regarded as vital by most utilities. Companies in Division I made an average of 25 annual architect calls; Division II averaged 43 calls per utility; Division III, 72; and the giant companies, Division IV, called on an average of 102 architects last year. All the reporting utilities indicated they made 3,482 calls.

Georgia Power called on 375 architects semi-annually and 125 quarterly. Montana Power Co called on 200 architects semi-annually last year.

How do utilities use the mails to promote cooking? Where do these mailings originate?

All the surveyed companies indicated they used mailing pieces of one kind or another. Nationwide, 26.6% were originated by the utility, 24.1% were designed by manufacturers, 24.4% were from Edison Electric Institute, and 24.9% were from Electrical Information Publications.

As expected, the larger companies tend to originate more mailings than the smaller ones.

Washington Water Power Co and Seattle Department of Lighting originated 100% of their own commercial cooking mailing pieces.

Montana Power depended on equipment manufacturer mailers for 80% of their mailings, while El Paso Electric Co used EEI mailers exclusively. Idaho Power Co and Utah Power & Light Co used EIP mailers mainly.

Keeping customers satisfied is of paramount importance to the utilities. This is evidenced by the fact that the reporting companies called upon an average of 96% of their customers after electric cooking equipment was installed. So satisfied with their electric equipment were 8,769 customers that they permitted their kitchens to be inspected by other prospects.

Some utilities work right along with the customer and lay out his kitchen for him. The reporting utilities indicated that they made a total of 1,194 kitchen layouts in 1960, averaging 30 per utility.

Pennsylvania Power & Light Co made the most kitchen layouts, 300; Ohio Power Co made 110.

Only 12 utilities offered any kind of wiring allowance or subsidy

Amazingly only 12 of the reporting utility companies indicated they offer any kind of wiring allowance or subsidy. These ranged from $1.50 to $10 kw.

Sixty-three companies regularly mail *Food Service* Magazine to an average of 42% of their food service customers, up 3% from 1959.

More Time Expended to Do Good Job

In 1959, the reporting companies were spending an average of 2.18 man years per 1,000 food service accounts. In 1960 this figure rose to 2.60. The cooking kilowatts are going in, but more time and dollars were needed to do the job.

Iowa Electric Light & Power Co had the greatest number of man years, 15.75, while Knoxville Utilities Inc had 13.25.

In the "kilowatts per customer" category (determined by dividing the total number of commercial cooking customers each utility serves into the commercial cooking load it added for the year) the little companies really shine. Knoxville Utilities, for example, added 19.16 kw for each of its customers. Idaho Power Co and Central Power & Light Co added over 8 kw each.

The companies in Division I averaged 3.33 kw per customer; Division II, 3.42; Division III, 2.62; and Division IV, 2.45. Nationwide average was 2.96.

Difficult to compute because most companies did not report was the percentage which commercial cooking revenue represented of total commercial revenue and total revenue. One large company reported the former as "negligible" while another smaller utility indicated 31%. The commercial cooking percentage of total revenue ranged from .01 by one company to 14% by another.

Similar results were reported in determining the percentage of commercial cooking in total commercial load and total load. One company reported that commercial cooking was 37% of its total commercial load and another said it was "negligible." The commercial cooking percentage of total load ranged from "negligible" to 17%.

Salespower	Division I (27 companies)	Division II (15 companies)	Division III (16 companies)	Division IV (16 companies)
Commercial cooking specialists	24	26	14	83
Average per company	.9	1.7	.9	5
All-purpose representatives (Average per company)	7	9	21	49
Time spent on commercial cooking	15%	18%	24%	15%
Average Sales Expense				
Average sales expense per Food Service account	$15.55	$36.07	$15.03	$7.01
Average sales expense per $ of EAR	.28	.35	.32	.32
Man-years				
Total man-years/1,000 commercial cooking customers	3.93	3.01	1.91	1.56

Reprints of this Commercial Cooking Report are available at 25¢ a copy.
Address request to: Editorial Department, Electrical World, 330 West 42 Street, New York 36, N.Y.

Easy to see why each oil replacement saves you as much as $48 with General Electric one-tank breakers

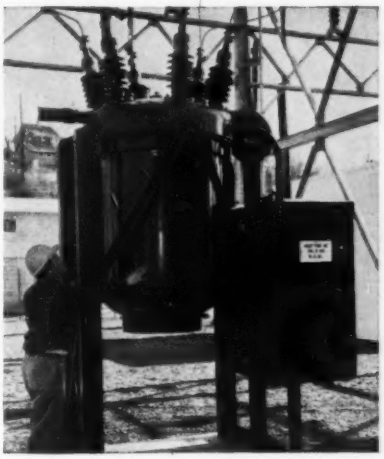
You save money with each oil change when you use General Electric one-tank subtransmission breakers. Here's why:

Oil replacement takes less time—there's only one tank to lower, fill, and raise, compared to three with other designs.

Oil capacity is reduced—For example, General Electric's 46-kv one-tank breaker requires only 350 gallons of oil compared to 430 gallons for a three-tank breaker of the same rating. At 60 cents per gallon, you save $48 each time you change insulating oil. Even at lower ratings, the saving is significant.

Oil changes are less frequent—there's less oil carbonization, because G-E one-tank breakers interrupt faults in five cycles—three cycles faster than industry standards.

Ask your G-E Sales Engineer for more good reasons to use one-tank breakers. Section 493-07, General Electric Company, Schenectady 5, N. Y.



General Electric one-tank breakers are rated 14.4 through 46 kv, 500–1500 mva.

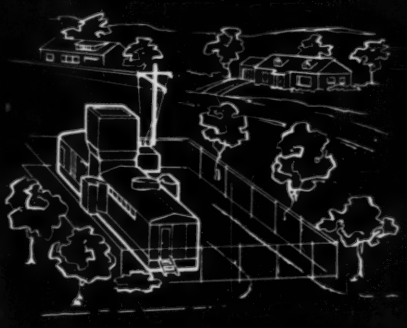
Progress Is Our Most Important Product

GENERAL ELECTRIC

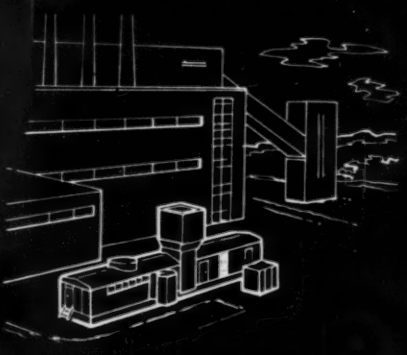
NEW...General Electric Package Power Plant Offers...

$85/kw multi-purpose power generation with proven gas turbine

Emergency, standby and end-of-the-line power from quick-starting, remote-controlled gas turbine package power plant.



Quiet, on-the-spot peaking power for suburban areas from effectively silenced gas turbine package power plant.



Emergency auxiliary power for steam station from package plant powered by experience-proven gas turbine.

Complete, self-contained, compact power plant — and it's available for operation on your system this year. The plant supplies dependable turbine power, 11,250 kilowatts*, for a variety of short-duration loads.

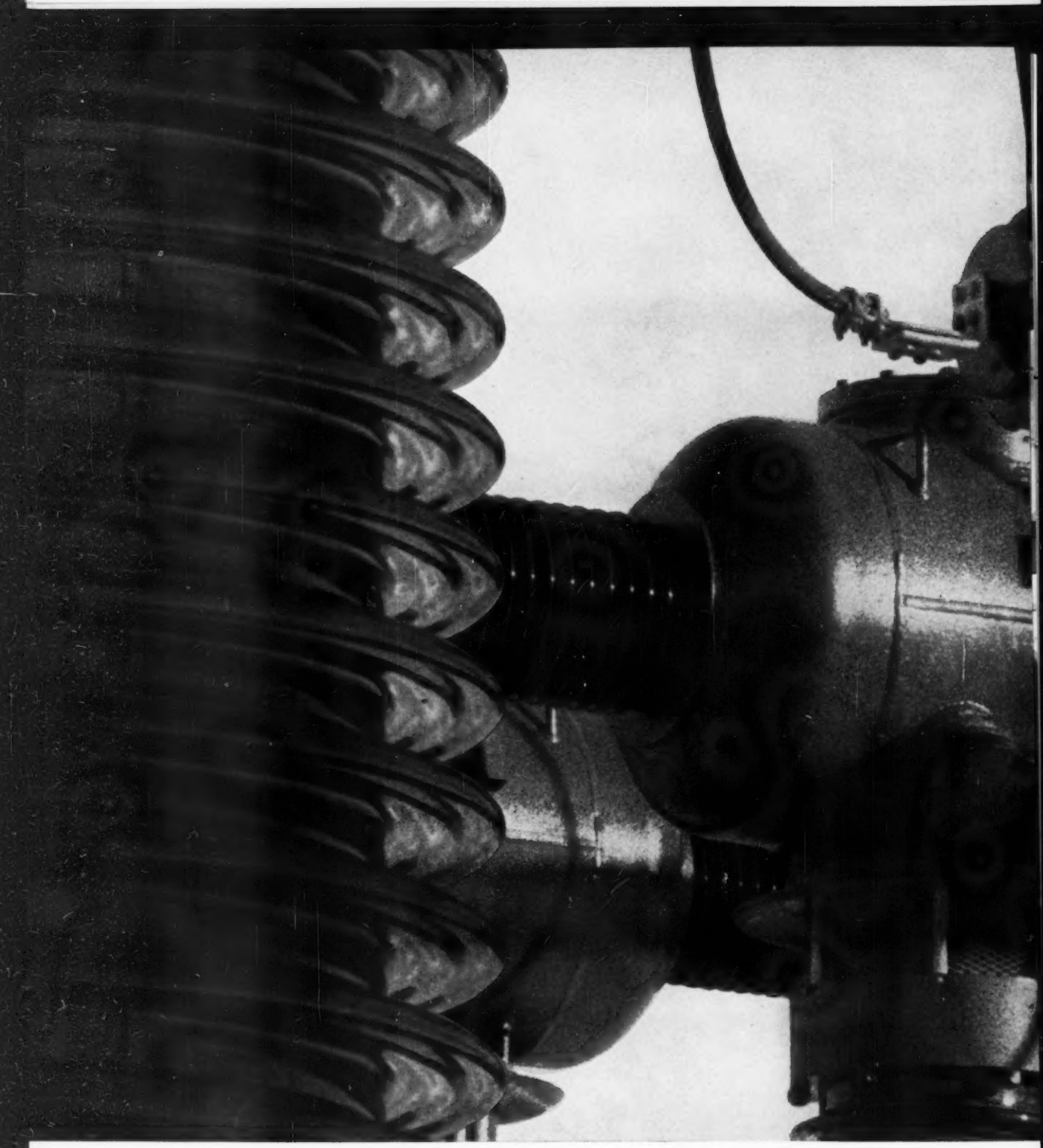
Package design offers significant manpower and maintenance economies, maximum site selection flexibility, and $85/kw low initial cost. G-E gas turbine reliability is backed by over five million hours of rugged operation — peaking and base-load utility service, continuous duty in process plant drives, start-stop service in locomotives, and base-load power for pipe-line pumping.

For more information on this new concept in power generation, contact your G-E Generation Sales Engineer or write for Bulletin GED-4217, General Electric Co., Section 247-44, Schenectady 5, N. Y.

* Peaking capacity at 80F, 1000-ft. altitude.

Progress Is Our Most Important Product

GENERAL ELECTRIC



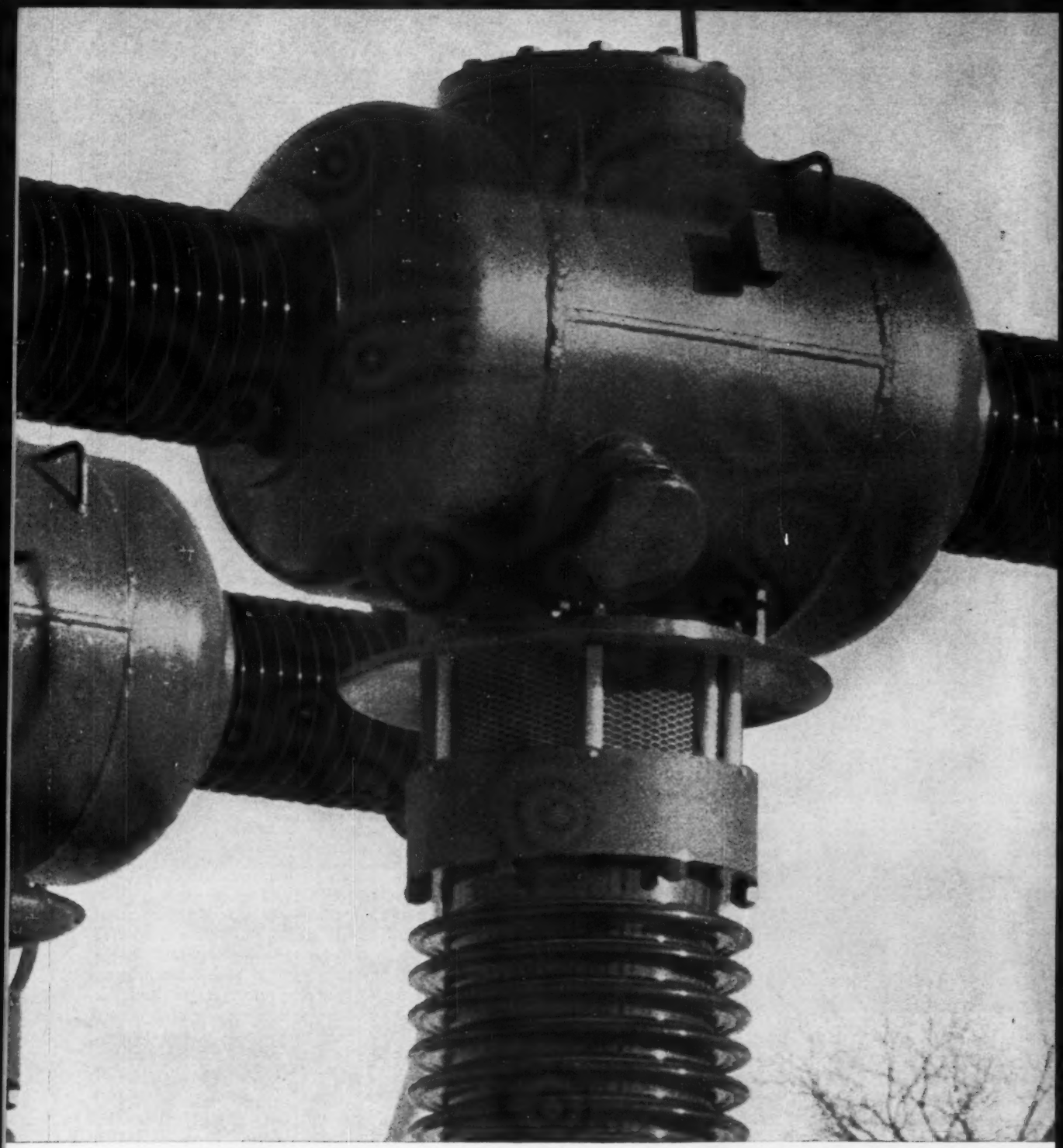
GENERAL ELECTRIC AIR BLAST BREAKERS . . .

Interrupt power faults in 1/20th of a second or less

It happens in a lamp bulb flicker your customers won't even notice.

At installations like the United Illuminating Company's new Sackett Point Substation (above), General Electric ATB Air Blast Breakers provide lightning-fast interruption to clear a fault in three cycles or less—1/20th of a second.

Faster yet, pioneering Air Blast installations of the American Electric Power System, now on order, will clear the backbone of its 345 kv trans-



mission network in two cycles—snuffing out the equivalent of 33½ million horsepower in 1/30th of a second.

Speed means better stability for your system when it is challenged by one of today's high capacity power faults.

Speed means breaker contacts erode less, providing tangible maintenance and dollar savings.

Speed means you can transmit more power per circuit.

Let's go into detail: In General Electric Air Blast Breakers, air is stored under pressure right at the contacts. As a fault is sensed, contacts and a blast valve whip open simultaneously. The contacts stretch the arc, and a torrent of high-pressure air blasts through it. The arc is instantly forced to arcing probes and orifices, and extinguished. Contacts reclose, and the circuit is ready to go back into service—fast.

For more information about why G-E Air Blast Breakers should stand as the first line of defense for your transmission system, talk to your General Electric sales engineer, or write for GEA-6908. *General Electric Company, Schenectady, N. Y.* 493-11

Progress Is Our Most Important Product

GENERAL ELECTRIC

345-Kv Double-Break Switches Shipped

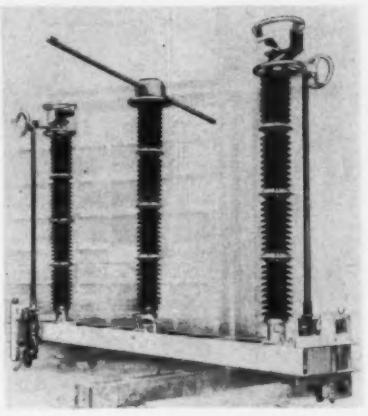
The I-T-E Circuit Breaker Co has just completed shipment of what is said to be the first two 345-kv double-break switches to be installed in this country. The switches are being installed in Consolidated Edison Co's Dunwoodie Substation, at the southeastern terminus of the 345-kv transmission line extending across New York State from the New York Power Authority's Lewiston Switchyard at Niagara Falls.

The new switches are rated 1,300-kv BIL, 1,600-amp continuous, and 70,000-amp momentary rating, and are built on 5-in. bolt-circle station-post insulators. The switches are equipped with grounding blades on both ends, for grounding either the 345-kv line or the high side of the step-down transformer, or both. The grounding switches are key-interlocked so that they cannot be closed unless the main switch has been opened.

The switches are being mounted on 16-ft phase spacing. Rod gaps, as indicated by the ball-shaped electrode, are located near the grounding switch mounting frame at each end of the switch (see illustration). They are used to control the negative impulse flashover to ground, to insure open-gap coordination under all conditions.

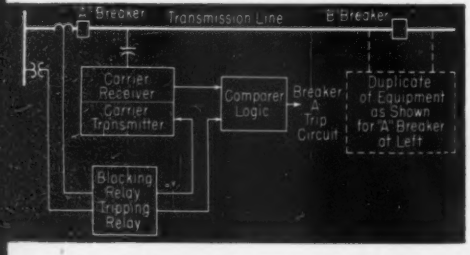
Radio-influence tests on the switch indicate R.I.V. values of less than 200 μv when a single-pole switch was tested with 225 kv from live parts to ground.

An interesting feature of the new switch is that it is designed with provision for adding surge-suppressing resistors at a later date. If voltage surges appear when the new double-break switches are operated, two resistors will be added, one at each break, so that the two resistors are inserted in series. The resistors will



be horizontally mounted and supported from the jaw insulator stacks in such a manner that increasing amounts of resistance are added as the blade opens. Resistors will be housed in sealed porcelain tubes.

Static Relay Equipment to Be Fault Tested



STATIC RELAY COMPONENTS are drawer-racked, from top: transceiver; backup relays & timer; phase relays; test rack; circuit elements; ground relay & logic circuits; and, 30-v supply

A newly developed General Electric Co static, directional-comparison carrier-current relay for high-speed protection of power systems will soon be field-tested by the application of a series of primary faults on an operating transmission line. In this way, their complete range of performance can be verified. The tests are to be conducted on a 138-kv line at the Philip Sporn Plant of the American Electric Power System, announced GE this month.

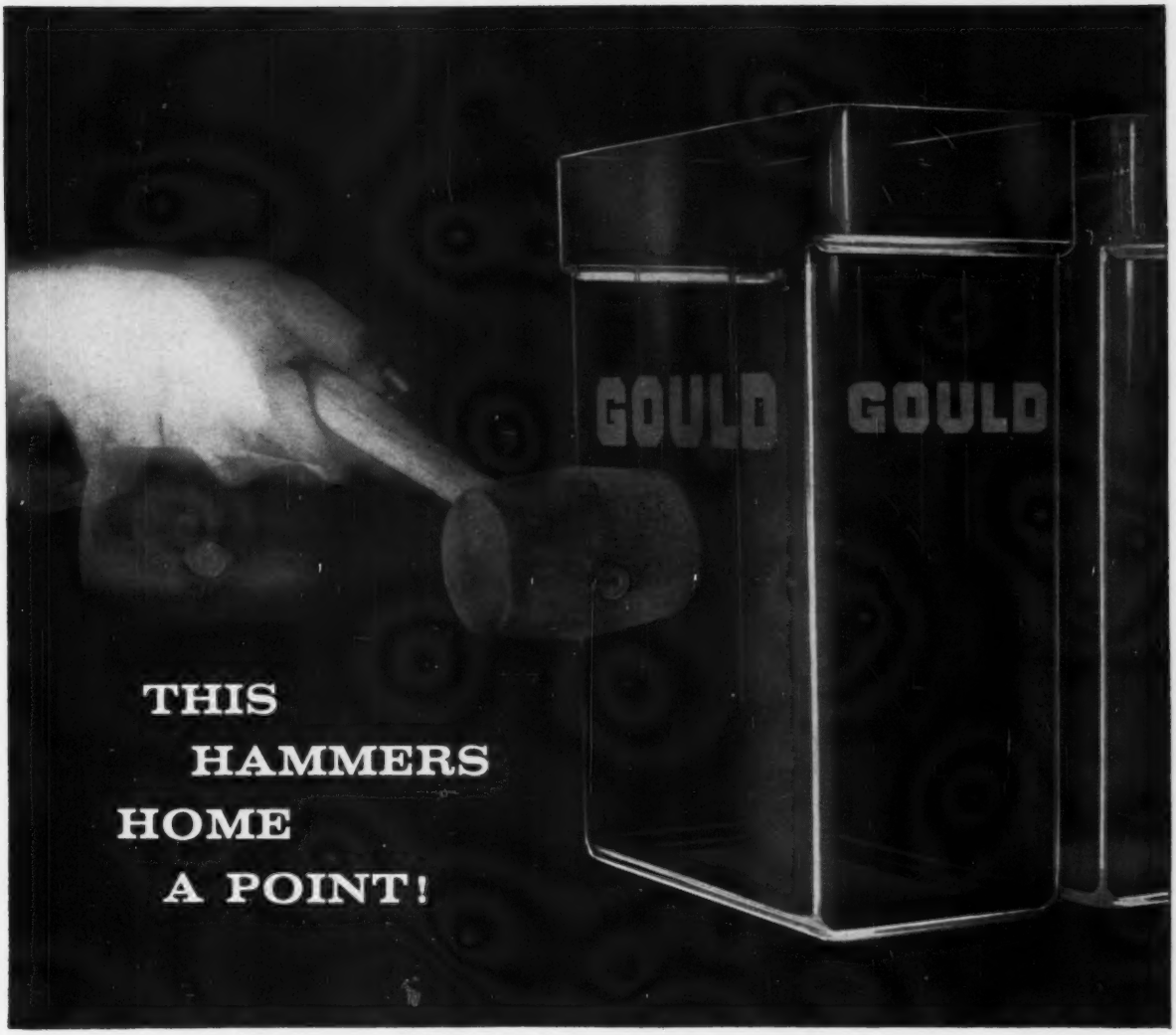
The new relaying equipment achieves a marked reduction in operating time as compared with conventional magnetic relays. Operation for 3-phase faults is achieved in less than 10 millisec, while operation for all other faults takes place less than 20 millisec. Specifically, the static, directional-comparison carrier-current relaying accomplishes this high-speed protection with static-phase distance and ground-overcurrent-static distance relays for high-speed backup.

Relay functions provided by this new approach include: mho, impedance, ground overcurrent, ground directional and timer.

For the most part, silicon transistors are used to minimize adverse temperature variation effects. Design features include the latest techniques for surge protection on both ac and dc circuits, plus a built-in, accurately regulated power supply. These relaying design characteristics work together through a system of advanced logic circuitry and precision high-speed coordinating time functions in order to detect faults, control communicating carrier equipment and trip-associated power circuit breakers.

Following the staged faults tests, this equipment will be put in service for an extended period of time to protect a 138-kv line—in order to gain operating experience before being placed into production.

(*More News of Manufacturers, p* 80)



Gould Stationary Battery Jars are Practically Indestructible

New Stationary Batteries in Plastrite Jars offer the same long life for which Gould has always been famous.

Gould Plastrite Jars have a higher tensile strength than most Stationary Battery Jars . . . will withstand greater impact than ever before! This means you'll be free from breakage in handling and shipping.

Plastrite Jars are a feature of Gould's all new batteries for stationary service. Lighter weight makes the jars easier to handle . . . original shape maintained because of higher heat resistance, higher elongation characteristics of Plastrite material.

Same Capacity, Smaller Size. Gould Plastrite Jars save you 30-40% floor space . . . give you the same capacity in a smaller size battery. They're available in Planté, Calcium, and Kathanode. For more details, write today or call your local Gould Office listed under "Batteries—Industrial" in the "Yellow Pages." Gould-National Batteries, Inc., First National Bank Building, St. Paul 1, Minnesota. In Canada, write to Gould-National Batteries of Canada, Ltd., 1819 Yonge Street, Toronto, Ontario.

More Power to You from **GOULD**

GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

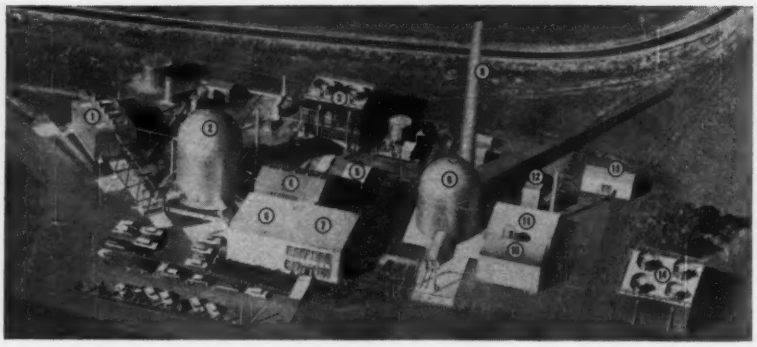
The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana



ESADA and GE Move Ahead on VESR

The $8-million superheat development reactor which General Electric Co will build at its Vallecitos Atomic Laboratory for operation in 1962 in an artist's conception of the completed plant site.

The superheat reactor, designed to help extend the technology of nuclear superheat for eventual application to large-scale nuclear power plants, will be built, owned and operated by the company's Atomic Power Equipment Department (APED), San Jose, Calif. A group of seven New York State investor-owned utilities, known as the Empire State Atomic Development Associates, Inc, (ESADA) is providing $5.75 million of the $8 million required toward the superheat development—this, to prepare for the probable construction (by one or more members) of a large nuclear power station in New York State.

The new 12.5-thermal-megawatt reactor, to be known as the Vallecitos Experimental Superheat Reactor (VESR), is being built near the Vallecitos Boiling Water Reactor so that it can utilize the VBWR's steam production and its condenser facilities.

Existing buildings and facilities shown in the site picture are: (1) VBWR fuel storage building; (2) VBWR containment vessel; (3) VBWR cooling tower; (4) VBWR turbine building; (5) VBWR miscellaneous warehouses and equipment shops; (6) Present VBWR control room. New facilities to be constructed are: (7) VESR control room addition; (8) VESR containment vessel; (9) VESR exhaust stack; (10) VESR dump condenser building; (11) VESR miscellaneous equipment bldg; (12) Gas-fired boiler; (13) Warehouse; (14) VESR cooling tower.

Sponsors of ESADA, who serve 98% of the customers in New York State, are Consolidated Edison Co of New York, Inc; Central Hudson Gas and Electric Corp; Long Island Lighting Co; New York State Electric & Gas Corp; Niagara Mohawk Power Corp; Orange & Rockland Utilities, Inc; and Rochester Gas & Electric Corp. Niagara Mohawk will supply architect-engineer services for the power plant.

The 12.5-tMw VESR will be the world's first separate superheat reactor. In a separate superheat reactor, saturated steam from an outside conventional or nuclear source is provided for superheating. In the case of the VESR, saturated steam will be furnished by the Vallecitos Boiling Water Reactor and by a gas-fired boiler.

Plans have been made to permit conversion of the reactor at a later date for operation as an integral superheat reactor, in which saturated steam is produced in one section of the core and superheated in another. As an integral superheat reactor, the VESR rating would be increased to approximately 70 Mwt.

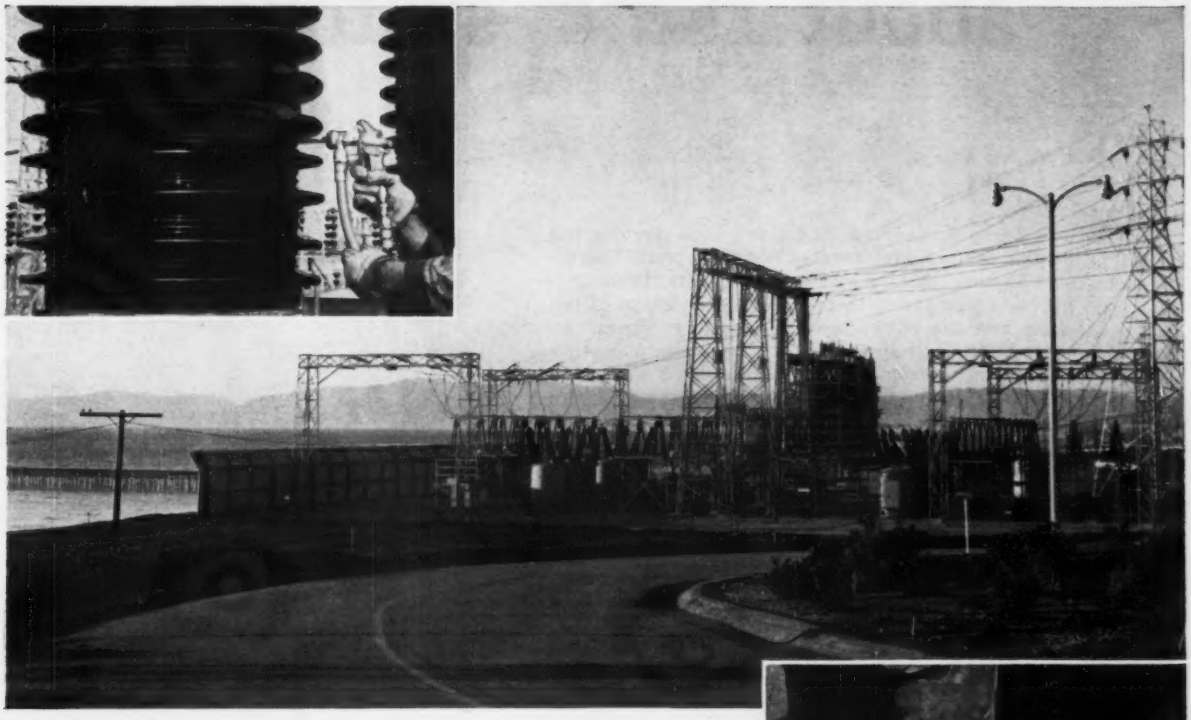
The initial reactor core will consist of 32 fuel assemblies, each made up of nine fuel elements. The fuel elements, especially designed by APED, will be hollow in the center so that heat can be transferred to the saturated steam from both inner and outer surfaces of element.

Core-inlet temperature and pressure will be 542F and 960 psig; core-exit temperature and pressure will be about 810F and 910 psig.

(*More News of Manufacturers, p* 84)

SILICONE NEWS from Dow Corning

No Flashover–No Leakage



Easy-To-Apply Silicone Coating Stops Arcing, Cuts Maintenance

With the wind-whipped Pacific Ocean less than 500 feet away, insulators in the switchyard of the El Segundo Steam Plant of Southern California Edison Company appear easy pickings for salt spray contamination . . . flashover . . . insulator leakage . . . lots of problems. But Southern California Edison has an effective and economical method for dealing with these contaminants.

An easily applied coating of Dow Corning 5 Compound causes mist, fog, spray and other moisture to "bead" and roll off without forming damaging conductive paths. The results: greatly reduced arcing and flashover damage to insulators; reduced service interruptions; reduced insulator maintenance costs.

Southern California Edison first applied Dow Corning 5 Compound on insulators in 1955. Insulators formerly washed down twice a month now require a silicone coating renewal only once a year. Outages and insulator damage have been eliminated while direct maintenance costs (labor and material) have been reduced.

Silicone compound can be applied with a rag or stiff brush . . . or recently developed spray equipment.

For free eight ounce evaluation sample, and information detailing how you can eliminate outages and insulator damage, write on your company letterhead to Dept. 3116.

The nearest Dow Corning office is your number one source for information and technical service on silicones.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

Here are answers to some about KPF switches

Q. *How can KPF switch blades maintain positive contact with switch clip under changing line sag conditions?*

A. Two heavy copper clips, bolted to a shoe carrying the flexible jumper, are mounted inside a special "horseshoe shaped" casting by two toggle bolts. These toggle bolts pass freely through the outer leaves of the clips, and the entire contact assembly "floats" on these bolts. Half-spherical bolt heads and adjusting nuts permit movement in any direction. The tension of the clip leaves on the blade is sufficient to insure positive alignment, since either clip or blade can follow the other to conform to line sag changes.

Q. *How can insulator stacks follow normal line sag changes?*

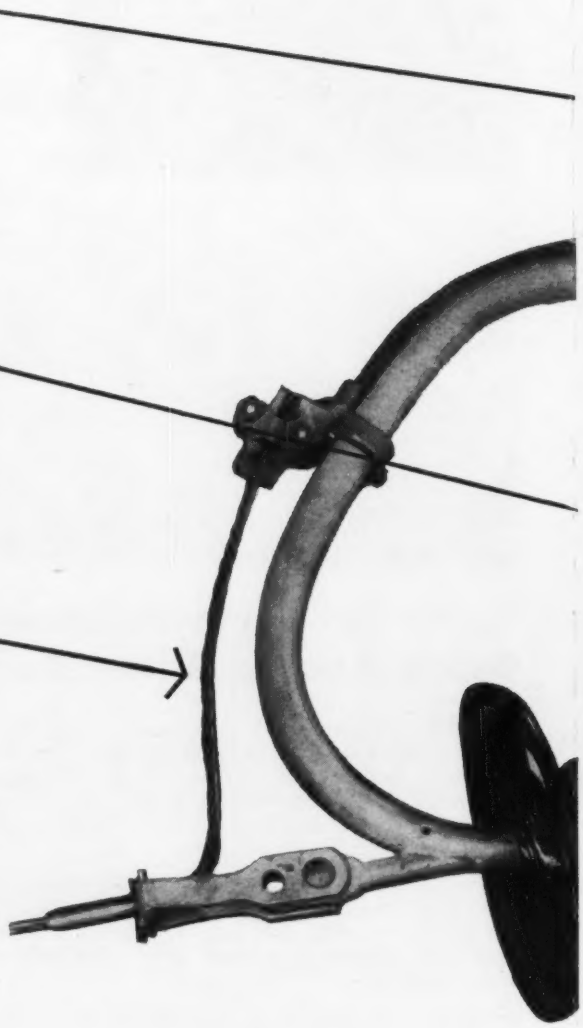
A. The insulator stack bearing units may be likened to limited universal joints. The actual bearing, a monel pin in an everdur trunnion, allows 90° movement of the rotating arm of the phase unit, as well as approximately 7° vertical movement to follow line sag. It is impossible for the bearing to bind under normal line stress, and insulator stacks always follow the sag of the conductor.

Q. *How are conductors connected to KPF switches?*

A. With KPF Type A switches, the user eliminates dead-end insulators. Any standard strain clamp can be used, and hot lines may be dead-ended directly to the phase units. Switch arms and dead-end eyes are integral with the insulator assembly. The conductor is lead through the strain clamp and on to a copper terminal on the switch arm. Aluminum conductors may be connected to the switch arm through special KPF terminals designed for this service. Type A switches may be mounted on a separate crossarm with conductors deadened below or above (for angle-pole installations, etc.). Switch operates equally well with or without line tension.

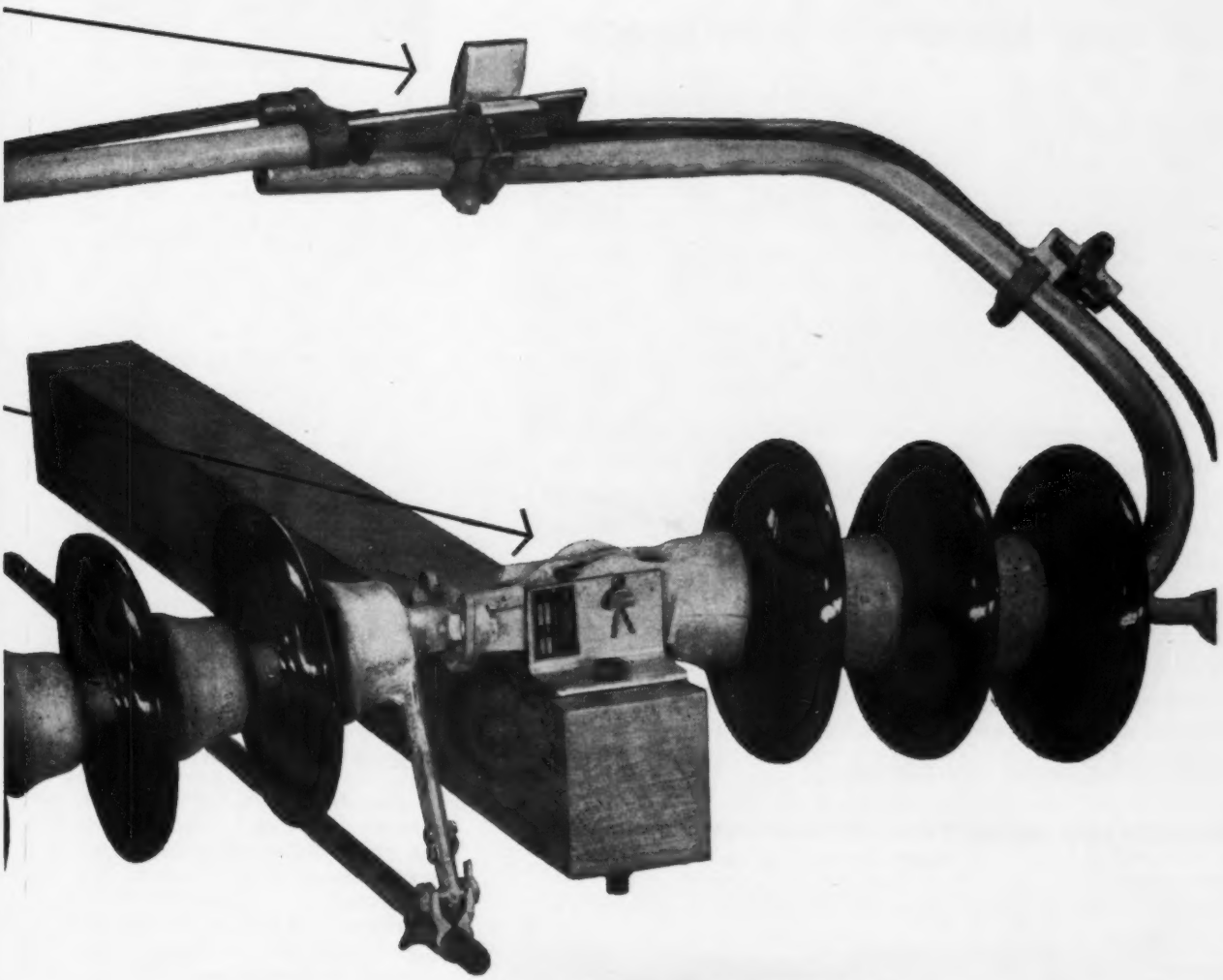
Q. *For what voltages are KPF air break switches available?*

A. KPF Type A and S standard "line-tension" switches are available for common voltages from 7.5 to 110 KV. Special switches combining a disconnect with a fuseholder (Type UF, double-cross-arm mounting) and for use where line tension is not present are also offered in these same voltage ranges. Ground switches are available for Type A or S switches. Type R switches are offered for use where line tension is not present or it is desired to use a specific type of apparatus insulator.



Request Catalog or write for details.
Test on your system this month!

often-asked questions



KPF

AIR BREAK
SWITCHES

Standard for half a century

KPF ELECTRIC CO.
P.O. Box 1257E
Stockton, California
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5218

NEW SANGAMO STACK RACK CAPACITOR EQUIPMENTS

put more kilovars in less space

Here's the newest Sangamo development in capacitor stacking units ... designed around the smaller and lighter Sangamo 50 kvar and 100 kvar capacitors. You get more kilovars in a given amount of space. For example, the new Sangamo stacking units with 100 kvar capacitors provide twice as many kvar as previous equipments, yet have the same length and height dimensions, and are only 12 inches wider.

There's a big weight reduction, too. Equipment weights with 50 kvar units are down 20 percent or more—those with 100 kvar units, down 25 percent or more.

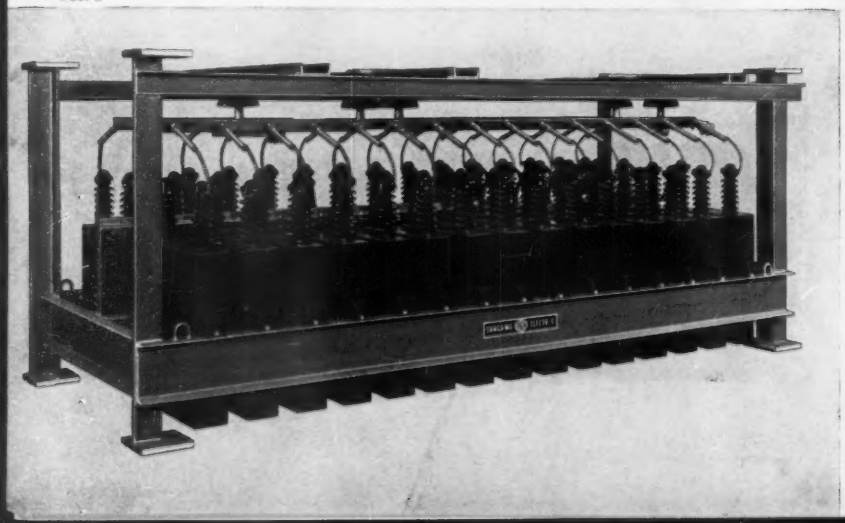
You'll save money, time, and substation space by stacking your kilovars with Sangamo stacking units. Compact and light, they permit better use of premium space, require minimum footing, and are easier to mount. Need less maintenance, too, because of stainless steel capacitor cases, all-welded aluminum rack construction, high structural strength, and non-ferrous fittings.

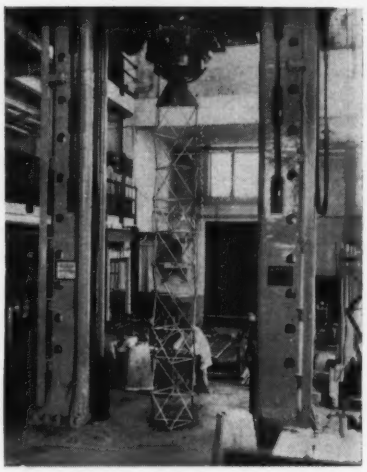
Remember, Sangamo equipments with 100 kvar units make it possible to use one rack where two were formerly required. This is especially important in 3-phase packaged substation equipments, and in some instances on large, high voltage stack rack installations.

Write us for further information.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

PC61-2





8-Sided Towers Prove Their Sturdiness

Octahedron towers like this one, made by Up-Right Towers, Berkely, Calif., have undergone rigid tests of strength and have proved to have one-third greater torsional rigidity than conventional towers.

An assembly of the eight-sided sections making up each tower is quickly erected, using just two basic parts: ball-shaped joints and identical struts available in aluminum alloy, steel or fiberglass—of appropriate lengths —and diameters and wall thicknesses for specific tower requirements.

HV Aerial Device Facility to Be Built

The Asplundh Chipper Co has announced the start of construction of a high-voltage testing facility for aerial devices at its Chalfont, Pa., headquarters. The facility, when complete, will have a capacity for testing up to 100 kv, 60 cps. Testing was initiated as a standard procedure April 3, using a new 30-kv tester, pending completion of the test center. The tests, designed to simulate actual field conditions as nearly as possible, are being made on all complete units prior to shipment and also on component parts where deemed necessary.

According to company spokesmen, the test program grew out of

an incident in which a utility employee received a minor burn when he contacted a truck body while standing on the ground. Investigations revealed that the customary megger testing did not expose the cause, which was traced by high potential testing to basket shaft to lower boom, boom levelling sheave at a component part shipped in error by an outside supplier.

Asplundh's high potential testing will cover all possible points at which contact could occur between an energized conductor and the aerial device. These include basket control to truck body, upper end of outer boom to truck body, and lower boom to truck body. Insulated basket liners will also be tested at the high voltage facility.

MANUFACTURERS BRIEFS

• **Westinghouse Electric Corp** has received word of the successful completion of the final phase of the startup tests at the Yankee Atomic Power Plant at Rowe, Mass. This test run of 500-hr duration at full licensed power of 110 Mw included the reactor designed and developed by Westinghouse, the largest the company has ever made. The plant will be limited to 110 Mw of electrical output until approval is received from the Atomic Energy Commission for an amendment to the Yankee license to permit operation at the designed capacity of the plant: 136 Mw.

• **Brand-Rex Div** of American Enka Corp has announced it will expand its West Coast manufacturing, engineering and sales operations into a fully integrated wire and cable plant in Gardena, Calif. The existing Santa Monica plant will be transferred to Gardena and fully integrated into newly created production operations. The primary insulation of conductors, stripping, braiding and shielding, and the extrusion of cable jackets will be conducted in the new 40,000-sq-ft plant.

• **Bethlehem Steel Co** will deliver a 168-in.-dia butterfly valve to the hydroelectric power plant at Hoover Dam by the spring of 1962. This will complete the last main generating unit of the project to provide 1,344.8 Mw.

SANGAMO POLE-TYPE CAPACITOR EQUIPMENTS

Now, Sangamo pole-type capacitor equipments let you pack more kilovars into existing pole space. These new, all-welded aluminum rack equipments are more compact and weigh less because they are designed around Sangamo's smaller and lighter 50 kvar and 100 kvar capacitors. For example, the length of a 12-unit, 600 kvar rack with 50 kvar units has been cut by two feet, while its weight has been reduced by 20 percent over previous models. Still greater weight and length improvement is obtained with 100 kvar units. Reduced length and lower weight minimize both twisting and bending moment—make installation easier and lower in cost.

Sangamo pole-type equipments are available as both in-line and cluster mounts. Standard equipments with 50 kvar capacitors can carry up to 900 kvar in both types. Standard equipments with 100 kvar capacitors can carry up to 1200 kvar with the in-line rack; up to 1800 kvar with the cluster mount.

The in-line type has front-of-pole bracing to provide maximum climbing space free of grounds. 5 KV insulated stranded cable is used for unit and switch connections. Unswitched equipments have provisions for future addition of switches. All-welded aluminum racks, non-ferrous hardware and stainless steel capacitor cases keep maintenance costs down.

Write us for further information.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

PC61-1

Get $1.12 worth of usable Kva for every $1.00 you invest in

WAGNER®

More for Your Money in Mechanical Features:

PLASTIC-COATED COVER

A porcelain-like coating gives improved corrosion resistance to tank covers, protects from line to ground, insulates small animals from the grounded cover to prevent outages. Applied to the covers, clamping ring and cover bolts, it is available without extra cost on all transformers with cover mounted bushings.

LONG LASTING TANK FINISH

A new formula anti-corrosive paint, carefully applied and thoroughly cured, provides a "Sure Seal" finish that withstands all temperature changes—is much longer lasting in corrosive atmospheres.

SAFETY KEYED BUSHINGS

Heavy wet-process porcelain high voltage bushings are safety-keyed. All terminals are key-locked in the tank wall. Hand tightening terminals are easily hooked up without tools. All bushings are suitable for use with either aluminum or copper conductor.

ROLLED-UNDER BASES

This new base design provides extra strength . . . better moisture drainage. Serves as an additional safeguard against leakage of oil from the tank. It lessens the chance for finish damage due to scraping.

HI-THERMAL-CAP

WAGNER® HIGH CAPABILITY TRANSFORMER
112% NAMEPLATE KVA 65°C. HOT SPOT RISE

TRANSFORMERS

Prize investment, these Wagner® Hi-Thermal-Cap Transformers. Wise buys in High Capability Distribution Transformers that pay off in one dollar and twelve cents worth of usable kva for every dollar of their cost. Solid performers that you can safely uprate to 112% of their nameplate kva without shortening their normal life expectancy, *and without exceeding the allowable 65°C hot spot temperature rise.*

We've built new, compact coils for these money-savers. They're wound LV-HV-LV around one insulating cylinder, and locked into sections of great mechanical strength by corrugated oil ducts and thermosetting insulation. Short circuit tests using 50 times normal current (twice as much as the industry standard) didn't even faze them.

The HI-THERMAL-CAP element, which combines this improved coil with a wound core of cold-rolled oriented grain steel, has excellent electrical characteristics: low impedance for better voltage regulation; low core and copper loss for economical operation. The result: you get top efficiency *plus* high capability with these transformers.

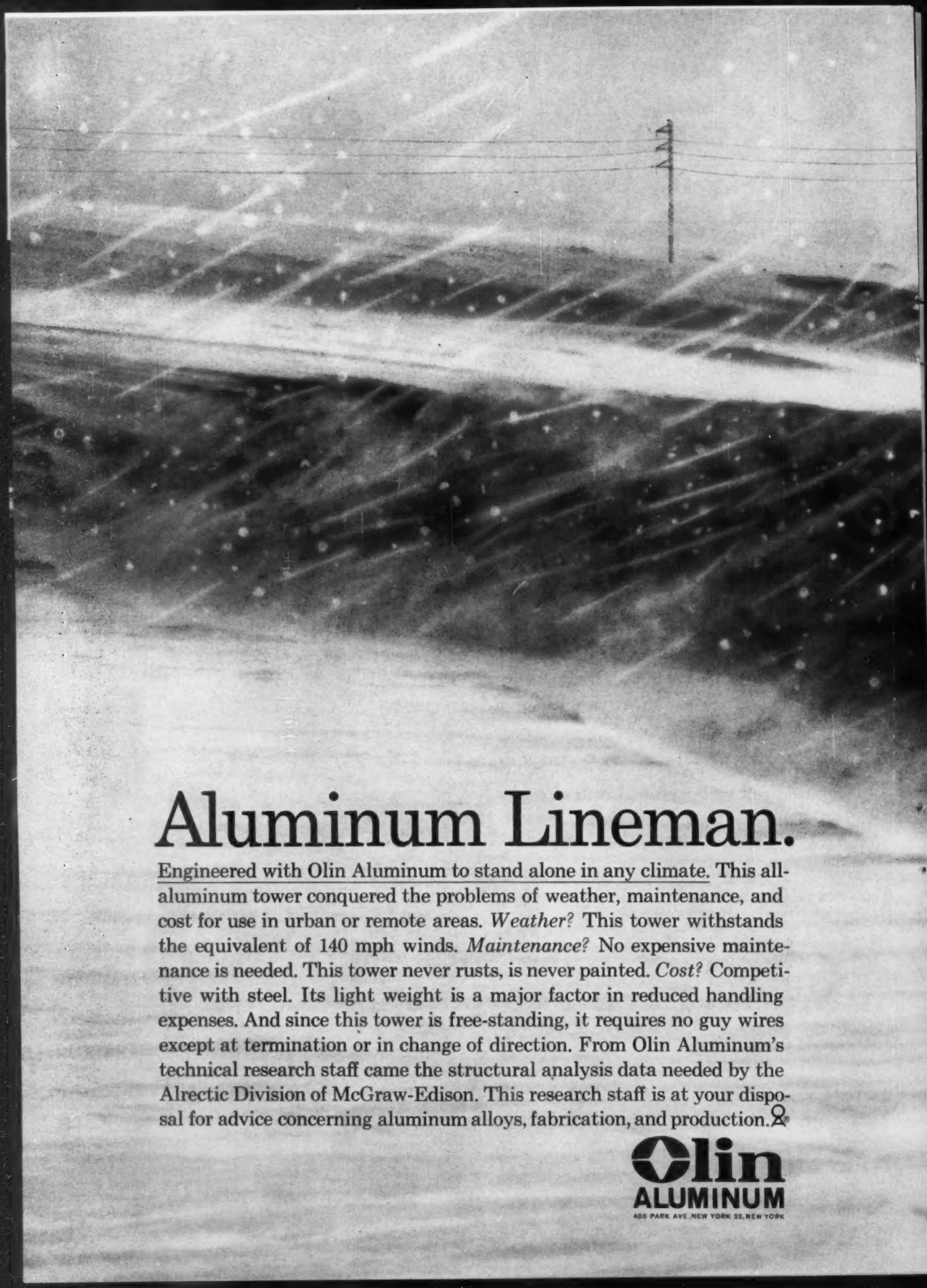
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6456 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

HI-THERMAL-CAP TRANSFORMERS are available in singlephase ratings of 167 kva and smaller, 15 KV and below for direct pole mounting. You can get them from factory, branch or distributor stocks now. And you can get complete information from your Wagner Sales Engineer. Check with him, or write us.

WT61-2



Aluminum Lineman.

Engineered with Olin Aluminum to stand alone in any climate. This all-aluminum tower conquered the problems of weather, maintenance, and cost for use in urban or remote areas. *Weather?* This tower withstands the equivalent of 140 mph winds. *Maintenance?* No expensive maintenance is needed. This tower never rusts, is never painted. *Cost?* Competitive with steel. Its light weight is a major factor in reduced handling expenses. And since this tower is free-standing, it requires no guy wires except at termination or in change of direction. From Olin Aluminum's technical research staff came the structural analysis data needed by the Alrectic Division of McGraw-Edison. This research staff is at your disposal for advice concerning aluminum alloys, fabrication, and production.

Olin
ALUMINUM
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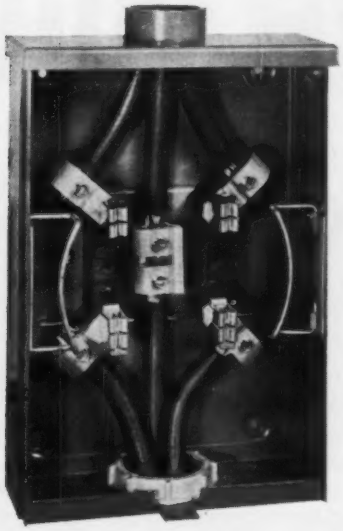
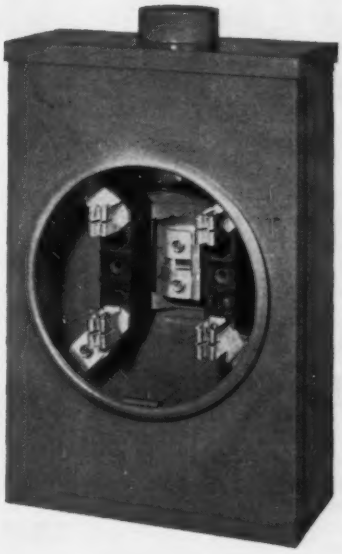
New Equipment



Meter Sockets . . .

. . . are of ringless or ring style. Either style in the Twin Series is available in a choice of three heights: 9, 10½ or 12 in. Sockets are extra wide and have many new features: a slotted type of terminal jaw which is said to permit cooler operating temperatures; meter supports which fold out of the way during installation; meter aligning guides to locate the meters properly in a vertical position. There is also a deep rain shed on the front of the unit, plus new style 4/0 angle tin-plated aluminum extruded terminals.
Milbank Manufacturing Co, Kansas City, Mo.

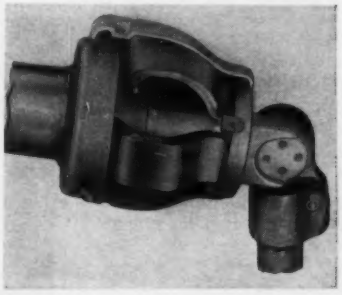


Current-Biased Capacitor Control . . .

. . . has a voltage-sensing device which is a balance-beam type regulating relay. The current pickup and its magnetic amplifier-controlled relay modifies the straight voltage sensitive control which would switch off capacitors when the voltage is high and switch them on when it is low. The current-sensing device gives two plateaus of operation—one for light loads and one for heavy. The time-saving element is in the current-signal source, which is comprised of a post insulator with a pickup coil in its base. The device, it is said, can be completely installed in less than half the time required to set up previous designs. The pickup coil has a voltage output proportional to the line current in the order of 1 v per 60 amp. The control's design is such that capacitors are kept off during light loads unless voltage drops to an abnormally low value. Under peak loads, the load current will activate the control device to switch on all the capacitors, providing a low-loss, high power-factor system.
Allis-Chalmers Manufacturing Co, Milwaukee 1, Wis.

Expansion Stud Connector . . .

. . . is designed for corona-free operation up to 345 kv. Other arrangements for application at 460 kv are available as part of the new line of weld-type corona-suppressing electrical bus fittings. Integral-shield design eliminates the need for external grading rings and welded construction is featured throughout. Recessed bolts mount unit at desired angle to the stud clamp.
Southern States Equipment Corp, Hampton, Ga.



(*More New Equipment on page* 93)

for the best practical applications for an

we'll give you

HERE ARE A FEW OF HUNDREDS OF USES FOR ONAN ELECTRIC PLANTS

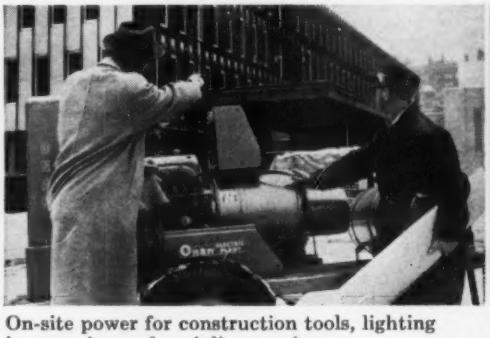
Standby electric power for
Hospitals
Schools
Office Buildings
Homes
Industrial Processes
Greenhouses
Dairy Farms
Hatcheries
Theaters
Stores
Service Stations
Radio & TV Stations
Hotels, Motels
Bridge Lift Gates
Toll Highway Booths
Restaurants
Banks
Military Installations
Resorts
Airport Towers
Microwave for Railroads and Pipeline Distribution
Sewage Disposal
Water Treatment Plants
Iron Lungs

Portable primary power for
Display Vans
Soft Ice Cream Vans
Airport Runway Lighting
Civil Defense Communication
Fire Dept. Lights, Tools
Police Radar, Lights, Communications
Oil Exploration
Mining Equipment
Pipeline Distribution
House Trailers
Magnet Generators
Home Builders, Carpenters
Highway, Dam, Bridge Construction
Electric, Telephone, Gas Utilities
Cemetery Maintenance
Golf Course & Park Maintenance
Electricians
X-Ray Equipment
Bookmobiles

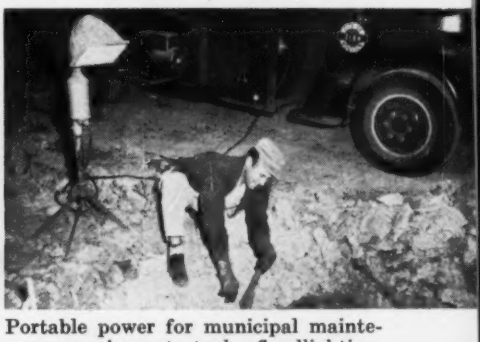
Marine power for
Pleasure Boats
Work Boats

Auxiliary power for lights, communications, appliances on Work and Pleasure Boats.

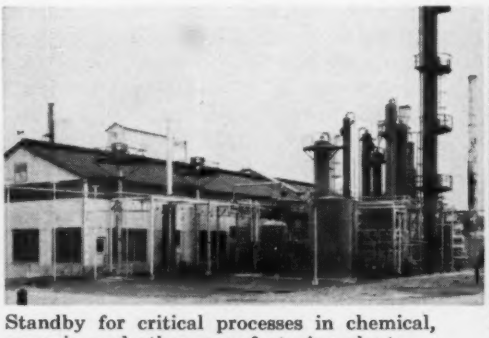
Portable power for pipeline X-Ray equipment, lights, tools and communications.



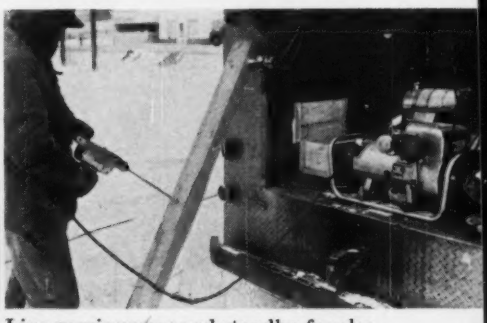
On-site power for construction tools, lighting in areas beyond mainline service.



Portable power for municipal maintenance equipment; tools, floodlighting.



Standby for critical processes in chemical, ceramic, and other manufacturing plants.



Line repair power and standby for electric, telephone, and gas utilities.

Provides power for lights, cooling, fudge heaters, fans for manufacturing ice cream vans.

Critical electric power for Civil Defense communications and lighting.

Onan Electric Plant that have never been used before

an Onan plant free

We'll give a 1,000-watt air-cooled Onan*(shown below) for each of the ten best applications for an Onan plant that have never been used before. Your idea can apply to any size or type Onan plant—from 500 watts to 230 kw—gasoline or diesel, air or water cooled.

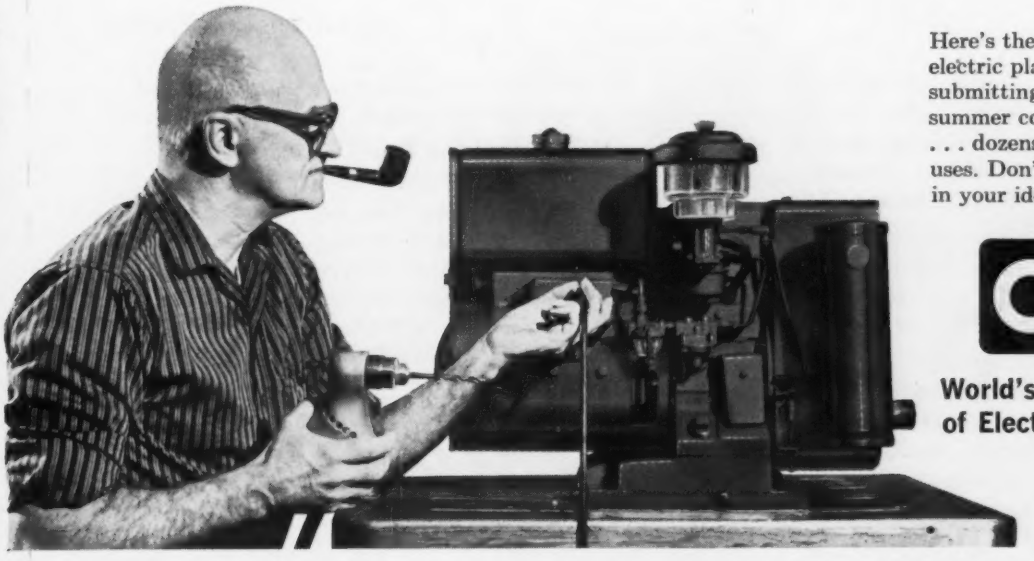
In 1926, when Onan pioneered with the "Ten-Lite"—a 250-watt d.c. plant—there was a clear-cut need: enough power to burn ten electric lamps in hundreds of thousands of homes without electric utility service.

Today, this market is virtually non-existent in the United States. But hundreds of new uses undreamed of in 1926 have increased the need for electric generator sets each year. Thus, because men with ideas continue to find new uses for packaged electric power, Onan continues to build more plants than any other manufacturer.

Quite often, we never know who had the original idea for a new application. And, we're sure, Onan plants are used today in ways we've never heard about. If you have an idea for a new use, it may be helpful to you to see Onan plants at your local distributor. He's listed in the Yellow Pages in every major city. Or, write Onan for free literature.

---

*You may submit as many ideas as you wish, but no more than one Onan plant will be awarded to an individual. There are no restrictions on form of entry . . . you may submit photographs, sketches or a written statement of any length you desire. Onan will judge all entries on the basis of originality, practicality and commercial utility, and decisions of the judges will be final. If the same suggestion or similar suggestions are made by more than one entrant, the first one submitted, according to the postmark, will be eligible for the prize. Winners will be notified on or before July 15, 1961. Entries must be mailed to "New Uses Contest," address below, and must be received not later than June 15, 1961. All ideas submitted become the property of Onan and, whether or not the entries receive an award, may be used commercially by Onan in any way it sees fit with or without acknowledgment of the originator. No entries can be returned.



Here's the 1,000-watt Onan electric plant you may win for submitting your idea. Ideal for summer cottage, home standby . . . dozens of portable power uses. Don't put it off . . . send in your idea right away!

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Ready for the future

O-B bushing experience, excellent facilities help Penelec energize new 460-kv system

Among the bushings supplied for Pennsylvania Electric Company's EHV project by Ohio Brass Company are three 460-kv, 1550-kv BIL, 800-ampere draw-lead bushings. Others include 115-kv, 23-kv, and 15-kv bushings.

You would expect flawless performance of the smaller bushings; O-B has been producing them for some time now. How about the new 460-kv bushings? What kind of performance do they promise?

These 460-kv bushings offer the same dependable performance as O-B's low voltage bushings. Although building commercial 460-kv bushings is not an everyday occurrence at O-B, designing, building, and testing extra-high voltage products have been going on for quite a few years. And, naturally O-B is proud to pour its know-how into this historic 460-kv project.

So, these new O-B bushings go into service for Penelec, a company who is planning for the future. May we suggest that you, too, plan the future confidently with O-B bushings - - bushings that are backed by nearly 50 years of experience. Specify O-B bushings to be sure you get them on your equipment.

OHIO BRASS COMPANY, MANSFIELD, OHIO

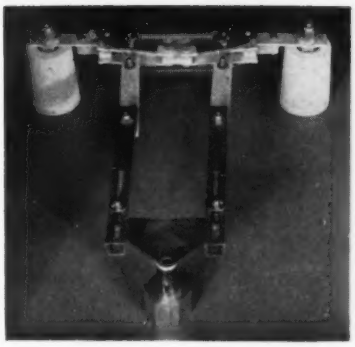
Ohio Brass

HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

10111-H

Load-Break Switch . . .

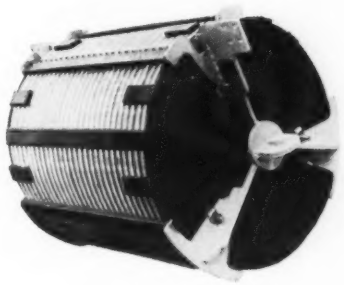


. . . **has three positions** and is used with GE's single-phase pad-mounted transformers. The 95-kv BIL switch is designed for typical underground looping feed system. Service can be provided from either of two cable sources, permitting complete switching flexibility in isolating feeder sections or transformers. Switch is 150 amp rms, continuous and load break; 9,000 amp rms asymmetrical, momentary; 5,000 amp rms symmetrical, make and latch; and 4,000 amp rms symmetrical, 2 sec—and can be used to locate faults. Handle can be operated with hot stick. **General Electric Co, Schenectady 5, N. Y.**

Polyethylene Compound . . .

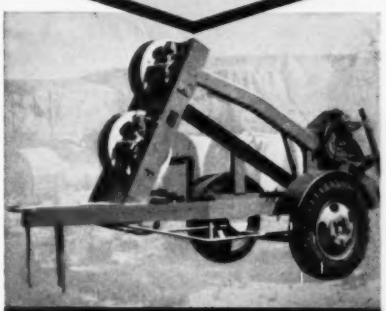
. . . **features low-loss electrical properties** and may prove suitable for insulation in high-voltage applications and others in which ultra-critical control of properties is required. DFDA-0173 Natural is a new development of the compound DFD-6505, formerly used for insulation in constructing the first trans-Atlantic telephone cables. DFDA-0173's composition, electrical characteristics, properties—and in particular, the melt index—are held within narrow limits. This is important in the insulation of long conductors where variation in the dielectric constant, dissipation factor and even thickness of the insulation reduces efficiency of the cable. The compound is characterized as an unmodified, very high molecular weight polyethylene compound containing only antioxidant. Resistance to stress cracking is increased even though the Butyl rubber, formerly used in such compounds to improve resistance to stress cracking, is not used here for that purpose; thus the major source of contaminants previously encountered is excluded.
Union Carbide Plastic Co, Div of Union Carbide Corp, 270 Park Ave, NYC 17.

Aluminum Line Traps . . .



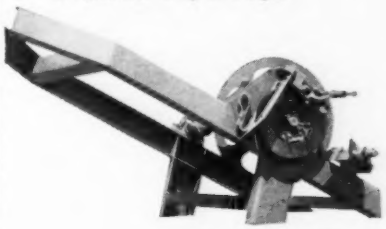
. . . **weigh 33% less** and have correspondingly improved strength-to-weight ratio. Ratings of 400, 800, 1,200, and 1,600 amp rms continuous are available. Short-time ratings range from 15,000 to 44,000 rms amp. Coils are wound of continuous multi-strand aluminum strap; end brackets are made from aluminum plates. Contact resistance is said to be eliminated by the welding of the coils to the terminal pad. Tough polyester resin bars separate the turns and provide rigidity to coils under short-circuit stress. The unit is easily converted from single to double-frequency operation; field tuning can be brought to approximate peak without instruments. A one-hand trimmer connector effects fine tuning, maintaining contact pressure without solder or wire clamp. The traps can be readjusted. Weight of the 400-amp unit is 200 lb; of the 1,200-amp unit, 700 lb.
Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Now—Convert your own Reel Dolly to a Bullwheel Tensioner
WITH A
PENGO 5000-U Assembly



5000-U assembly installed by City of Medicine Hat, Alberta, Canada

Here's an easy way to build up a modern bullwheel tensioner at low cost—simply install a PENGO 5000-U Bullwheel Assembly to your old trailer or reel dolly. You'll have a tensioner with Neoprene-lined 26" bullwheels, capable of handling practically any distribution line stringing job at tensions to 2,000 lbs. at up to 4 mph.



Support arms, reel spindle with reel brake, and hand rewind assembly. 2⅜" spindle will handle reels to 75" diameter, 44" width unless reduced to fit your trailer.

Bullwheel and tension brake assembly may be purchased separately.

We invite you to write or wire for literature, prices—please address Dept. 124.

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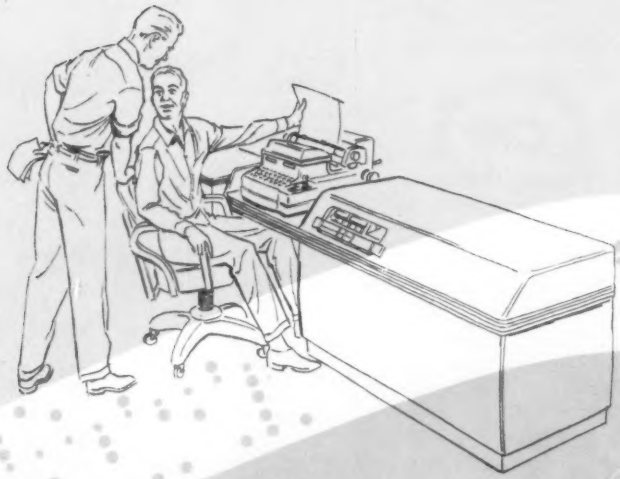
REDUCES YOUR DISTRIBUTION COSTS

with its all-new, electronically designed



"7000" SERIES DISTRIBUTION TRANSFORMER

Central Transformer Corporation is proud to present its new "7000" line of distribution transformers — designed to meet the utility's growing need to reduce distribution costs.

Central's engineers, through the time-saving facility of the Electronic Digital Computer, were able to review and analyze basic design factors in literally thousands of combinations.

The most efficient combination of design factors, coupled with exhaustive research and thorough testing of every component, enabled Central's engineers to create the "7000" Series.

COORDINATED E-T-M FACTORS MAKE THE "7000" SERIES TRANSFORMER YOUR BEST BUY!*

1. REDUCED COPPER TO CORE LOSS RATIO, resulting in lower impedance, lower total losses and better regulation (especially during peak load periods), gives you LOWER OPERATING COSTS, INCREASED LOAD REVENUES and FEWER CHANGE-OUTS.
2. NEW INSULATION SYSTEM, featuring 130°C **Heavy Epoxy** insulated conductors on BOTH high and low voltage windings, gives you HIGHER LOADABILITY and LONGER TRANSFORMER LIFE.
3. IMPROVED CORE AND COIL ASSEMBLY, featuring stronger bracing, gives you INCREASED SHORT CIRCUIT STRENGTH.
4. IMPROVED MECHANICAL FEATURES, including insulated cover (15KV class), stainless steel cover clamping band and internally clamped bushings, give you LOWER MAINTENANCE COSTS and IMPROVED CONTINUITY OF SERVICE.
5. IMPROVED OVERALL DESIGN, resulting in a transformer that is smaller in size and lighter in weight, gives you LOWER INSTALLATION COSTS.

*—Electrical-Thermal-Mechanical

NEW RATINGS*

55°C.	5 Kva	10 Kva	15 Kva	25 Kva	37½ Kva	50 Kva	75 Kva	100 Kva
65°C.	5.6 Kva	11.2 Kva	16.8 Kva	28 Kva	42 Kva	56 Kva	84 Kva	112 Kva

(*shown on name plate)

CENTRAL CTC **Transformer Corporation**

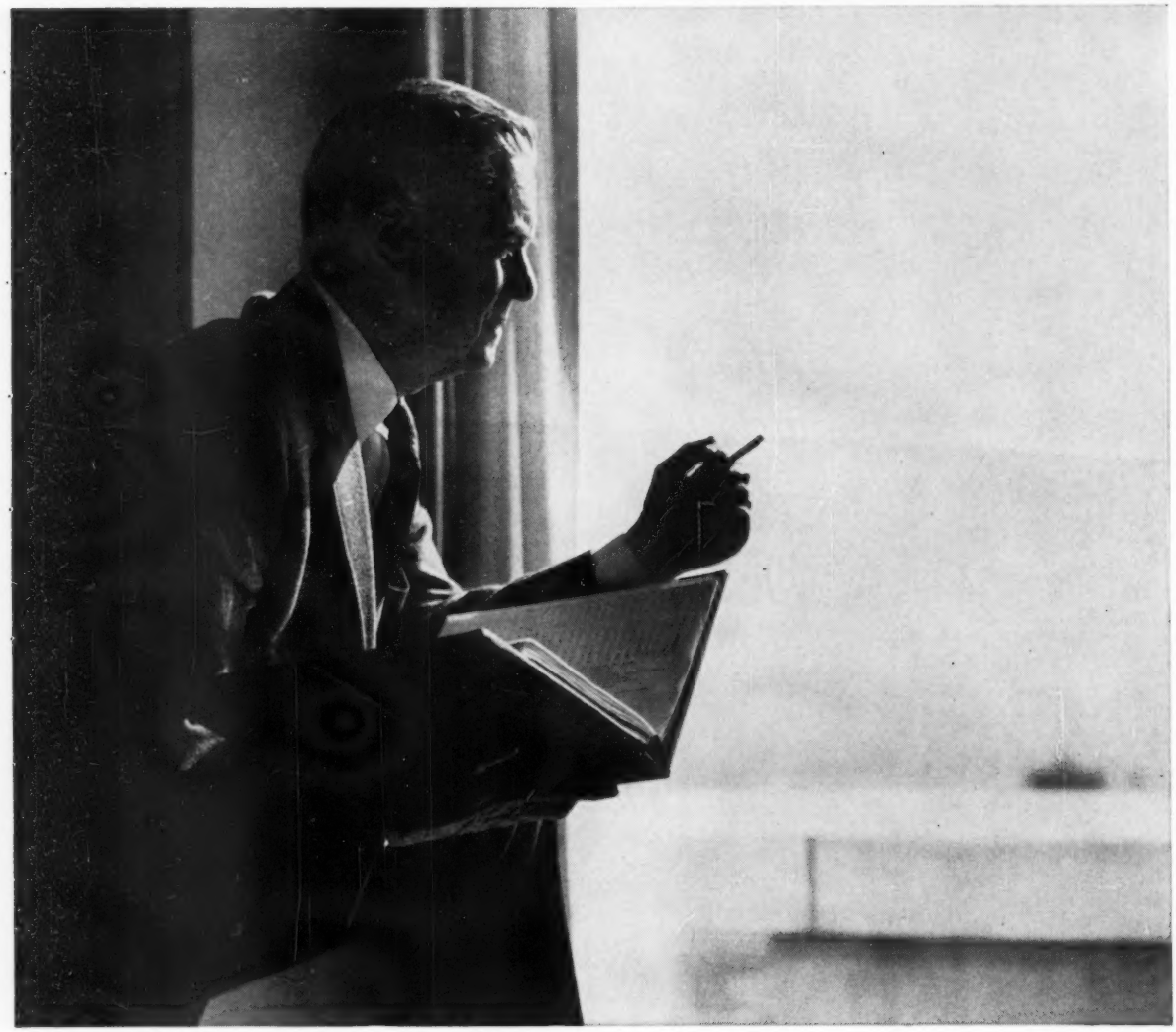
Sales Offices in Principal Cities

Telephone JEfferson 4-5332

PINE BLUFF, ARKANSAS

Plants at Pine Bluff, Arkansas and Arcadia, Florida

NEMA



How long will utilities be able to buy the right kind of coal?

In the look-ahead world of electric utilities, 1981 can be here tomorrow morning.

The projected growth rate of electric needs makes it clear that the man who buys coal for a utility must pick his suppliers not only for what they can deliver now but for the next 20 or 30 years. He must be able to count on adequate reserves—of not just *coal*, but the right *kind* of coal. Coal that's free of hidden incremental costs that raise the invoice price with excessive coal handling, ash handling, equipment outages and freight charges on inerts. Coal that can deliver steam at the lowest possible cost.

To this utility man who lives partly in 1981, Island Creek offers a mighty reassuring picture of long-term quality and uniformity of supply. We'd welcome a discussion of your own searching look into that *very* near future. Write, wire or phone.

ISLAND CREEK Precisioneered Coal

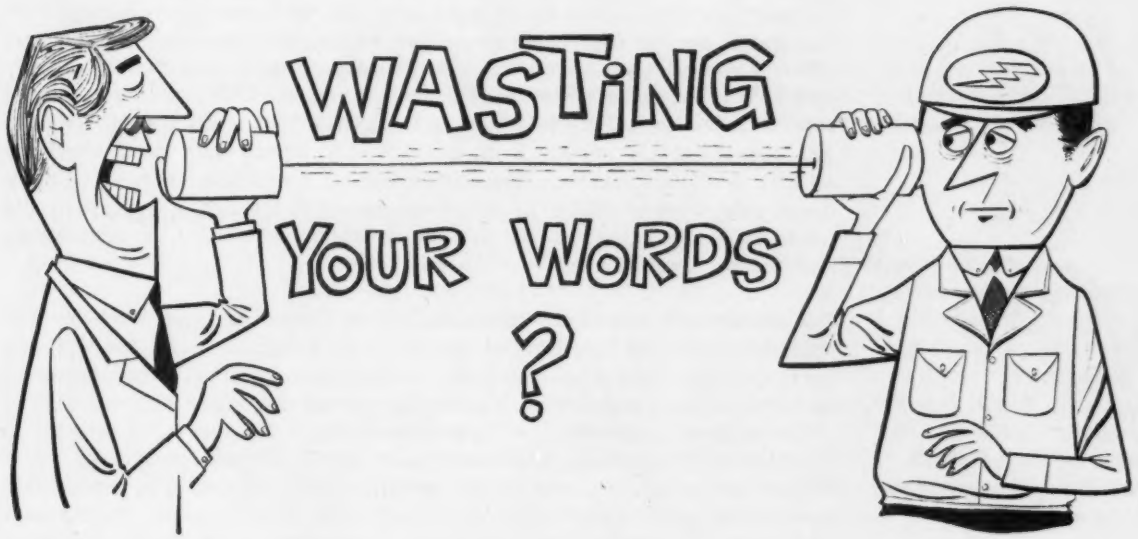
You can depend on Island Creek . . . a career company dedicated to coal

ISLAND CREEK COAL SALES COMPANY, Chafin Building, Huntington 18, West Virginia • Chicago • Cincinnati • Cleveland • Detroit • Greensboro • New York • Pittsburgh

Electrical World

APRIL 17, 1961

Management Newsletter



Many companies aren't getting through to their employees. Management knows its information objectives but is ineffective in getting its point across. The news it provides is too skimpy, and even this meager morsel is all too frequently misdirected. Wasted communications dollars can be the result along with an information program that takes second place to the grapevine.

These conclusions come through loud and clear in a study recently completed by the Opinion Research Corp of Princeton, N. J. The research team descended on six American companies, each with over 1,000 employees, and evaluated the communications philosophies of the managements. Then it turned to the workers to ask specific questions about the information they wanted, and how well they thought management was providing it. The gap between what the companies were offering and what the workers were looking for was enough to make an industrial relations executive's hair stand on end. And two of the six companies in the sample were utilities.

In all of the companies, management seriously misjudged the type of information that its employees were looking for. When put to the test, one utility company under-estimated employees' information needs in ten out of 20 topics. The other utility did slightly better, misgauging worker curiosity in six out of 17 issues. But this is only half the story. Not only did management under-sell the things employees were interested in learning, but it repeatedly pushed information that workers were simply sick of hearing. Safety information is a good case in point. Most management people rank safety as a must for employee communications. But for the six companies surveyed, only one employee in four wanted to hear more about safety.

Why is management so far off frequency when it comes to speaking with its workers? Opinion Research studied the results of its questionnaire and found that

some of the assumptions upon which management based its approach were as dated as the roll-top desk. Among the assumptions are these:

- Employees are not really interested in the company's progress.
- Management can control the information that the employee gets.
- All employees have the same information appetites and one bill of fare is fine for all.
- Management knows best what information is good for employees.

How do these assumptions check out?

Are employees interested in the company's progress? Yes indeed. When questioned about the state of business, 49% of the employees in the six companies indicated that they wanted more information. On the topic of job security, 55% thought the company should tell them more. But Opinion Research found a very different response when it asked about recreational and social news. In this category only 22% of the workers wanted additional information. Utility employees seemed to be exceptionally neglected by their management. They scored a higher percentage than the survey average when asked if they wanted more news about job security, and lower than the average when asked if they wanted more social news. This would seem to indicate that they are getting a fat diet of promotions and marriages, and are being starved to death on matters concerning the performance and future of their company.

Can management control the information that the employee gets? Probably not. With the newspapers, television, magazines, union publications and meetings, and the simple mechanism of the grapevine, the worker is going to get some information on every subject. It goes without saying that not all this information will be kind to the company's viewpoint. A company can look at the same set of figures as a labor union, for example, and come up with entirely different conclusions. And without attempting to decide whose interpretation is correct, it is certain that management wants its viewpoint heard. But too often, it seems, management decides not to express itself on a subject. The workers then get all their facts and interpretations from other sources.

Can one bill of fare satisfy all employees? Every executive will quickly admit that the news requirements in his company are different from the requirements of the workers in the plant down the road. What many executives don't realize is that within their own company, the requirements of individual workers differ by a wide margin. First, they can be broken down according to length of employment. New employees are concerned about the things that help them find their way in the organization—policies, rules, opportunities for advancement. High seniority employees want to know more about health and retirement benefits. Workers close to the peaks of their careers take the long range viewpoint—is the company growing, is it meeting competition, is it getting a square deal in national and local policies?

A workforce can also be broken down according to the type of work done. Engineers, clerical workers, supervisors, salaried workers, hourly workers, all have different informational needs. Are these important? Company magazines following the something-for-everyone formula score in the 40% proven readership range. On the other hand, 67% of the white-collar and professional employees of a major appliance manufacturer could prove readership of their own monthly magazine specifically prepared to meet their needs.

The final assumption companies seem to make is that management knows best what employees ought to know. If this were ever true, it is no longer the case. The assumption smacks of the paternalistic—the feeling of management that workers must be sheltered from harmful information. But employees today are quite capable of handling facts concerning their company. What's more, if they don't get them from the company they are interested enough to get them somewhere else. This fact becomes obvious after taking a quick look at the composition of the work force. According to the Bureau of Labor Statistics, better than 52% of the present work

force is composed of high school graduates. Almost 11% has had four or more years of college education. This means that today management is talking to the best educated work force in this nation's history, or for that matter, in the history of any other nation.

Conclusions of the Opinion Research survey may seem to leave management in a quandary. Most companies today are vitally interested in communicating with their employees. But how do you solve the problems that Opinion Research has brought to light? How can you know the kind of information that your workers value? And how can you get this information across to people who have indicated such divergent needs?

After evaluating the results of its survey, Opinion Research finds that a program is suggested. And the beauty of the program is that it doesn't require any new talents on the part of management. What's necessary is for the company to apply the same strategy it uses in marketing its product to the business of marketing its ideas.

Marketing Approach to Communications

Starting point of the marketing approach to communications is the employee audit. This serves the same function as sounding out the market to find what new products the public wants. But here, the product is information. Management must learn the subjects that the employees feel are most important. Are they concerned about automation and its effects on their jobs? Do they want to know about the company's plans for the future? Do they know what competition is doing? Do they understand how government regulation affects their future? Are they anxious to know what the company is doing to assure job security. These and many other possible topics can be listed on a questionnaire. The employee is simply asked to check whether he has enough information on each subject, whether he wants more information, or whether he simply isn't interested.

But the audit goes further. It also asks the worker to list the source that he normally would turn to for information on these topics. Opinion Research, in the six companies used for its study, was able to isolate several employee shopping habits. For news about the company's future plans, and for the activities at other company locations, workers seem to turn to the company publication. For information about the benefit plans, employees rely on company sponsored meetings. If they want to know something about company policies, and how they themselves are affected, workers will generally bring their doubts to the supervisors. These shopping patterns will differ from company to company as will the employee information needs. Only by asking the workers can management be sure of the picture in its own plant.

The second step in the marketing approach is strictly up to management. After learning what kind of products the consumers want, a company will usually look at the facilities it has available to produce the product. The same thing is true with ideas. Management now knows the areas in which workers want more information. The company then has to ask itself, "What do we want to say on these subjects? What do we want to say about automation, foreign competition, government regulation, profits, or any other subject in which the employees have expressed an interest?" This means the company must do some soul-searching. It must set down its objectives clearly and concisely both on the long-term subjects that will be important as long as the company is in business, and the short-term issues that are controversial here and now. This soul-searching is not the job of the industrial relations people. It must begin with the president, and include every important official in the firm.

When this is done, management should know three things. It knows the topics to be discussed. These are the ones with the highest worker interest. It knows what

the company wants to say on each of these topics. It also has a clear picture of the sources that workers usually turn to to learn something about each of these issues. But now comes the heart of the marketing operation: getting the product across to the consumer.

Here the first step is designing a package that catches the consumers' interest. Business men know that consumer acceptance makes or breaks a product. Yet they frequently package their communications in a way that makes workers pass them by. Sometimes they use the "company speaks" approach, a discussion of company problems written in the president's poor imitation of Victorian prose. Worker's greet this presentation with a yawn. What is really needed is a simple approach to key ideas; ideas geared to the employees' interests. You're trying to get across a viewpoint. The nearer your language is to that used by the men in their homes, the better your chance of being heard.

Secondly, put the package in the store where the employee usually buys. Capitalize on his shopping habits for particular types of information. If your audit shows that workers ask their supervisors about company policy, then distribute your information on this topic through the supervisors. Before sending out a bulletin on a policy change, call the supervisors together and give them a thorough briefing. Make sure they know all the "why's" behind the change. You may find that for other information employees rely on the grapevine. You can assist the unofficial grapevine with one that gives the true dope. An information booth, located in the building, may do the trick. When rumors start, workers can simply stop at the booth and get the real scoop. But such an information stand must be fully informed. If the employees get just a taste of wrong information here, nothing you say or do will ever get them to return.

There are many methods of selling ideas. The company house organ is, of course, a major one. The information booth is another. Flash bulletins can also help. These can be run off as a topic breaks with the promise that fuller information will be available later. This keeps the worker looking to the company for the follow-up rather than turning to an outside, and probably less informed, source. Special displays can also be useful for driving home a point. One company takes rejected products and mounts them in a display. With it is a card telling the workers what the piece of faulty workmanship cost. It may be only a few dollars, or it may be a sizable order. But it's there every day to remind the men that poor work comes out of their pockets as well as those of the stockholders.

Segregate your information. Every company uses a slightly different approach to bring its product to different markets. Do the same thing with ideas. This may mean two publications, one geared to white-collar people, and one to manual workers. Or, it may mean two major features in the same publication written for the two groups and perhaps even written by a respected representative of each group. A new innovation probably affects clerical help differently than linemen. Two separate meetings to explain the innovation may then be in order.

Finally, advertise. Just as you would plug a product, plug your communications network. If you start an information booth, make sure the workers know it's there and what it's for. If you plan to explain a change in the pension plan at a meeting, be certain the meeting is well publicized so that every worker knows when it will be held and why he should attend. If the house organ is going to explain the results of automation at another company location, send out hand bills plugging the edition. In this way, employees will be waiting for it, and the editor's efforts probably won't end up in the waste basket. Use every media you have available to push every other media.

Ideas are like every other product. Market them properly and you'll find lots of customers. But if you handle them poorly, the product won't sell. You will simply be wasting your words.

1886

40°C RISE

25 KVA

1910

55°C RISE

25 KVA

1961

65°C RISE

25 KVA

Watch for the Westinghouse announcement on the new LL-65 distribution transformer soon

You can be sure . . . if it's
Westinghouse

-70962

B.C. Power Picture Confused

A turbulent power situation in British Columbia has been roiling matters on several fronts recently.

Following B. C. Premier W. A. C. Bennett's remarks that B. C. might have to consider taking over B. C. Electric Co, Land & Forests Minister Ray Williston said the possibility of taking over three B. C. power companies will be discussed when B. C. considers its position in the next federal-provincial conference.

The companies are B. C. Electric and East and West Kootenay Power & Light Companies.

Last month, Premier Bennett proposed in the legislature that the government take over B. C. Electric unless a greater share of federal revenue from the province's natural resources was forthcoming.

Before the legislature prorogued for Easter, it moved that the government "consider the advisability of placing" the three utilities "under public ownership" (EW, April 10, p12).

B. C. Electric also ran into trouble on another, related front.

At National Energy Board power hearings, the B. C. Power Commission opposed renewal of B. C. Electric's license to export to Port Roberts, Wash., and to the Northwest power pool. B. C. Electric has been supplying Port Roberts since 1922 and has been a member of the Northwest power pool since 1947. It was seeking renewal to export to Port Roberts for a 25-year period and to the Northwest power pool for an eight-year period. Previously, the licenses were renewed annually.

Commission Seeks Delay

The Power Commission asked the Energy Board to defer the license "until the power situation in B. C. has been further clarified." It further contended that an export license could conflict with arrangements to be worked out on the development of the Columbia River.

A Power Commission spokesman at the time revealed that the B. C. Energy Board is working on plans for a provincial transmission grid. He said the Board had also arranged a meeting of representatives of B. C. utilities to discuss integration and co-ordination plans related to Columbia development.

Two days after it opposed B. C. Electric's application, the B. C. Power Commission applied for a similar license before the National Energy Board. It sought a license to export interruptible power to the U S for a five-year period "for which planning is considered to be reasonably firm." A Power Commission spokesman said it already holds an amended license to export surplus interruptible power. This license expires at the end of 1961.

The Power Commission said it intends to export surplus interruptible power to the Bonneville Power Administration, and the proposed export will not adversely affect the supply of energy available for Canadian requirements. The Commission has already negotiated an agreement with BPA for exchange of surplus energy and for emergency relief.

As these actions were taking place against a backdrop of the proposed Columbia River development, the Vancouver Board of Trade took side with those urging that the backdrop be delayed.

The Board recommended that Canadian ratification of the treaty be delayed because of doubts whether the project would be economically advantageous to B. C. and whether markets for the power would be available.

It urged that Canadian authorities start "immediate negotiation" with the U S to ensure the sale of surplus Columbia power in the U S at a "guaranteed and satisfactory price." The treaty should not be ratified by Canada "unless modified to meet this requirement," the Board said, or until "some agreement has been reached which assures . . . markets."

Meanwhile, reduced development of the $630-million Peace River hydro scheme appeared imminent as a result of several studies made by the Peace River Development Co to see how its project could be started under a variety of conditions.

W. C. Mainwaring, company president, said PRPDC has its application ready to submit to the Public Utilities Commission for approval but must hold back until the power picture is clarified.

In any event, the project will not proceed further until August when the B. C. Energy Board issues its findings regarding the Columbia River situation and whether Columbia and Peace can be coordinated and built simultaneously.

Huntington Computer Control Improved

Computer operation of Huntington Beach unit 3 is continuing in the preliminary testing and calibration phase, reports Southern California Edison Co. Operation under full computer control is expected sometime later this year (EW, April 10, p39).

The 220-Mw unit was first synchronized in November and it was placed under dispatcher control as a system generating resource in December 1960. Testing of computer control has been intermittent, subject to the limitations of demands made on the high-efficiency unit for system production.

Edison engineers affirmed that some problems have been encountered in the areas of isolation relay matrix design and sensor circuit noise. "Hardware" modifications and expansion of computer memory (up from 16,000 words to 40,000) have successfully resolved these problems.

But the time required to make these changes has forced Edison to sandwich dynamic testing of the unit into inflexible production schedules which are made more rigorous by dry year conditions.

Except for these time effects, the difficulties encountered are considered to be no greater than anticipated in similar pioneering efforts. Edison spokesman told *Electrical World* that this experience has in no way diminished its enthusiasm for computer operation of steam plants.

CEI Boosts Walker to VP-General Services

Robert E. Walker has been elected to succeed Alexander J. Paull who, for health reasons, resigned as vice president-general services of Cleveland Electric Illuminating Co.

Walker will head four departments: personnel, purchasing, office building services, and systems and procedures. He has been systems and procedures department manager since joining the company last year. Stanley E. Wertheim succeeded Walker as systems and procedures manager.

WALKER

Evans Promoted to Vice President at Wagner Electric Corp

EVANS

Wagner Electric Corp has promoted J. Cedric Evans, who is controller, to vice president. Edward G. Holtzman, secretary-treasurer, and Carl E. Widell, vice president, were elected directors, replacing H. N. Felton who retired and V. W. Bergenthal who resigned.

Evans has been controller since 1956 when he was promoted from assistant controller, a post he had held for four years.

Hollingsworth Becomes VP-Sales

Hubbard & Co has elected Thomas Hollingsworth vice president-sales. Hollingsworth, most recently general sales manager, will operate from Hubbard's new executive offices at 5401 W Roosevelt Rd, Chicago.

Before joining Hubbard, he was product planning manager for Westinghouse Electric Corp.

HOLLINGSWORTH

PERSONAL BRIEFS

E. M. Simpson, secretary and assistant treasurer of South Carolina Electric & Gas Co, has been elected secretary-treasurer of Carolinas Virginia Nuclear Power Associates. He succeeded the late **J. M. Costello.**

The new chief of the construction branch of Corps of Engineers' north Pacific division is **Mihills O. C. Kelson.**

Laurence R. Metcalf is the newly appointed chief of hydraulic design section of the design branch of Portland Army Engineer District.

Lowell Painter has succeeded **James T. Manion** who retired as manager of Montana Power Co in Anaconda.

American Electric Power Service Corp has named **John A. Tillinghast** to be project engineer of the 580-Mw Unit 4 at Indiana & Michigan Electric Co's Tanners Creek plant.

West Penn Power Co has promoted **Alex R. Newell** to western division manager.

D. B. Wheelock, commercial vice president, has retired from California Electric Power Co after 41 years with the utility. **George M. Thompson** has resigned as secretary and assistant treasurer of Potomac Electric Power Co, as of his normal retirement date. And **Paul M. Lenhart,** assistant treasurer of New Jersey Power & Light Co, retired

(*Continued on page* 104)

Wiley BOOKS—

A handy new reference by an expert . . .

DESIGN OF SMALL DIRECT-CURRENT MOTORS

By A. F. PUCHSTEIN, *Consulting Engineer, Jeffrey Manufacturing Co.* This new book presents a wide variety of methods for solving the problems involved in the calculation and design of direct-current machines. The thoroughness characterizing the book is apparent not only in the scope of design problems covered, but also in the extremely detailed presentation of the methods themselves.

Techniques are given both for those cases in which mechanical parts are available and for those in which design must be started from the ground up. In every instance, the treatment includes precise instructions, alternate procedures, numerical examples, and exact results.

Stresses step-by-step thinking

Throughout the book, emphasis is on electromagnetic aspects of design problems and following an orderly procedure. Many of the procedures given here will not be found in any other publication. Problems are included at the ends of chapters, to call attention to significant theoretical and practical design points.

1961 407 pages $12.00

ELECTROMECHANICAL ENERGY CONVERSION

By DAVID C. WHITE and HERBERT H. WOODSON, *both of M.I.T.* Covers fundamentals of electromechanics, then uses them with selected models to derive the dynamics of typical physical devices.

1959 646 pages $12.50

Send now for your on-approval copies

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after 35 years with NJP&L and an affiliated electric company.

At Carolina Power & Light Co, **R. B. Carpenter** has become assistant secretary in addition to his duties as treasurer.

Puget Sound Power & Light Co has named **Orland G. Hunt** commercial and industrial sales director.

Graybar Electric Co, Inc, has named **T. R. Gale** manager-utility communications sales. He was formerly assistant manager of government and communications sales.

General Electric Co has appointed **David A. Pritchard** manager-sales for the wire and cable department.

Stewart R. Chapman has been appointed assistant sales manager, aluminum products, for Rea Magnet Wire Co, Inc, a subsidiary of Aluminum Co of America.

In Burndy Corp's utility-industrial division, **Norman Sacks** has become product development manager for the engineering department, and **Ezra Meltzer** has become chief industrial engineer.

Norman O. Kirkby has been named vice president and general manager for G&W Electric Specialty Co.

I-T-E Circuit Breaker Co has promoted **Elton W. Turner** to assistant sales manager of the Victor insulators division. In the Bulldog electric products division, **Hugh V. Diamond Jr** became product promotion manager of residential equipment and **Richard R. Frede** was named product promotion manager of fusible equipment.

Combustion Engineering, Inc, has made **Lambert J. Gross** vice president-finance and **Mitchell Kiamie** controller.

Blaine E. Beck has joined Precision Transformer Corp as vice president in charge of manufacturing. **Gerald F. Simmons** assumed responsibility for design and development of dry-type transformer lines.

Westinghouse Electric Corp has placed its appliance sales group within the major appliance division's marketing organization, headed by **J. J. Anderson,** marketing manager. **L. G. Berger,** head of the appliance sales group will retire. **W. A. Douglass** will succeed Berger as manager of field sales. Also, Westinghouse Electric Corp has named **William R. Tincher,** former associate director of the Federal Trade Commission bureau of litigation, to the new antitrust section of the company's law department.

NEW PARTNERS: (left to right) Cunningham, Meals, Rector, Rumans, Runyan

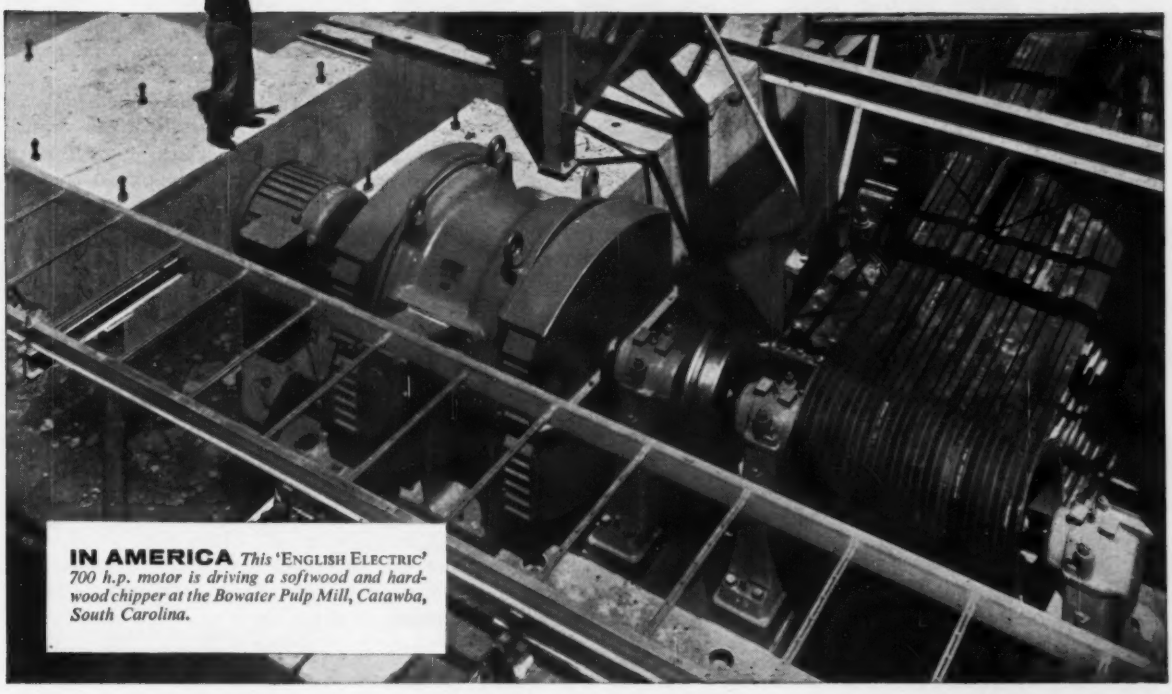
Five Named Burns & McDonnell Partners

Burns & McDonnell Engineering Co has boosted the following staff members to partnerships: Leo L. Cunningham; Jasper W. Meals; Alwin H. Rector; William W. Rumans; and Edwin J. Runyan.

Cunningham, a civil engineer, has been with the firm 15 years and has specialized in water works and hydraulics. Civil Engineer Meals has specialized in hydraulics and administrative duties.

Rector, an electrical engineer, specializes in electrical work, nuclear projects, and rate studies. Rumans, an electrical engineer, has electric systems and power plants as his specialties. Civil Engineer Runyan has been in charge of the Washington, D.C., office since 1958.

"Start her rolling!"



IN AMERICA *This* 'ENGLISH ELECTRIC' *700 h.p. motor is driving a softwood and hardwood chipper at the Bowater Pulp Mill, Catawba, South Carolina.*

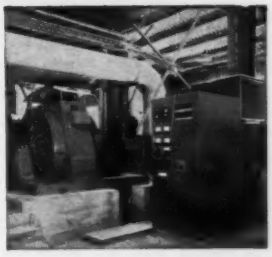
Throughout the world new 'wheels' of commerce start rolling. At Catawba, near Rock Hill, South Carolina is the latest pulp mill of the Bowater organisation. Here 400 tons of sulphate pulp (the valuable strengthening element in most forms of paper) is produced from each day's consumption of 800 cords of pine.

Drive motors for use in various processes were supplied by 'ENGLISH ELECTRIC'. These motors range from 250 to 1,000 h.p. and are used for driving pumps, fans and chippers.

Motors, designed and manufactured by 'ENGLISH ELECTRIC' ranging from 68,000 h.p. wind tunnel compressor motors to fractionals for domestic appliances, serve industry, commerce and the home in almost every country of the world. Wherever power is used or needed 'ENGLISH ELECTRIC' is ready to generate it, distribute it and put it to use. Work on any location is backed by a worldwide organisation with factories in five continents.

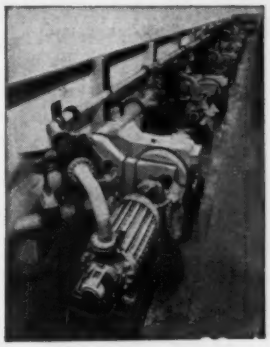
IN THE PHILIPPINES

An 'ENGLISH ELECTRIC' *1,320 h.p. synchronous induction motor and control cubicles driving a ball mill at the Republic Cement Corporation Plant, Manilla.*



IN SOUTH AFRICA

Six of the 44 'ENGLISH ELECTRIC' *2,100 h.p. salient pole synchronous motors driving water drainage pumps 5,400 feet below ground in a South African Gold Mine.*



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SERVICE FACILITIES ARE AVAILABLE THROUGH THREE LARGE CANADIAN PLANTS

Tells SEE Industry Needs Capital (*Continued from page 55*)

housing policy and including electric living programs as one effective way of carrying the offensive.

Today's higher lighting levels, he said, constitute an electric heating system, requiring very little additional heat to wrap up the electric package.

R. B. Dorsey, Gulf Oil Co, said that residual fuel oil production continues to be a decreasing percentage of the crude oil processed, improvements in refining having increased the amount of higher priced fuels. Although crude oil has increased, the residual fuel has remained fixed, even while requirements increased.

Dorsey noted that this situation was off-set initially by greater imports, so that there was no serious disturbance of the price structure. This has not remained true since oil imports came under federal control, he added.

Dorsey expressed the opinion that in time there will be no residual fuel produced in the US and that eventually there will be complete decontrol of imports. In the latter event, fuel oil imports, he said, will find their own supply level and price.

The US gas supply continues to grow, Harold Burrow, Tennessee Gas Transmission Co, declared, noting that gas reserves are 41% above what they were ten years ago. But government regulations, he said, may influence the price, some upward movement of price appearing inevitable.

Coal reserves are tremendous, and the coal industry has done a good job of price stabilization through modernization despite increased wages, said S. L. Jewel, Peabody Coal Co. He noted that coal transportation developments will be a big factor in determining whether new electric plants will be built at the mine.

W. T. Rice, Atlantic Coast Line Railroad, proposed the merger of railroad systems and elimination of labor featherbedding as major steps in bringing down the cost of coal transportation. His own line and the Seaboard Line, he said, are working on merger plans. But railroads generally, he added, must do a better job of pricing and marketing.

A. C. Ingersol, Federal Barge Lines, Inc, described the waterways serving electric companies of the Southeast and pointed out the inherent low cost of such transportation of coal and oil.

Safety awards went to Potomac Electric Power Co, New Orleans Public Service Co, and the Kingsport Utilities Co. Safe driving awards went to Gulf States Utilities Co and Arkansas Power & Light Co.

O. J. Miller, Duke Power Co, was elected SEE president, and the following are vice presidents: R. Baxter Wilson, Mississippi Power & Light Co; J. J. McDonough, Georgia Power Co; and, R. Roy Dunn, Potomac Electric Power Co.

APC Studies Role of Generation Types and Patterns (*Continued from page 59*)

increase with line length and terminated transformer zero sequence impedance.

Electrical performance of a one-mile, 345-kv woodpole test line built by Illinois Power Company has been entirely satisfactory during the first seven months. Over the next two to three years it will be used for tests during which phase spacing, number of insulators per string will be reduced to the minimum values compatible with good engineering design. Observations will be made of RI, leakage currents, and the effect of electrostatic fields on hot line maintenance work. Details were described by T. W. Schroeder, Illinois Co, and J. E. O'Neil, Westinghouse.

New Distribution Equipment Introduced

Distribution sessions interest focused on a new high-voltage load-break switch for isolating transformers or sectionalizing a loop, demonstrated by R. B. Pherson, Westinghouse Electric Corp, as a new development in residential underground systems. This switch, rated 15-kv, 350-amp interrupting capacity, is an integral part of the service unit's high-voltage bushing. Load-breaking is obtained by drawing the arc rapidly through a cylinder and then "splitting" the arc by filling the cylinder with a plug of very small annular clearance. The load device is operated by a hook-stick.

The primary service unit, said co-author R. F. Lawrence, Westinghouse, could be used in a primary-voltage service system for high-use, large-lot areas. But it doesn't appear economical for subdivisions with lots that are as small as 70 x 100 ft over-all.

Of hundreds of reports from utilities which participated in a two-year test program of the self-regulating transformer, "a high percentage" included voltage charts similar to the one discussed by D. A. Manning, Line Material Industries. The chart depicted the action of a 25-kva transformer serving 18 residences, one traffic light and three 2,400-lumen multiple street lights.

While the primary voltage varied from 126 to 119 v on a secondary base, said Manning, the secondary voltage was held between 122-125 v. He also pointed out that voltage charts and comments from customers indicate that self-regulating transformers are successfully supplying optimum voltage to industrial areas. As a conservative estimate, he added that self-regulating transformers can increase net revenues $1 per kva of nameplate rating.

Industry guides for thermally-uprated transformers, having upgraded insulation, based on 65C average winding rise, can be modified by factors developed by J. R. Meador and J. H. Carpenter, GE. Loading transformers using these factors will result in loss of life less than indicated in the guide for non-uprated transformers loaded on the 55C basis.

Revised breaker standards improve the method of rating a breaker to withstand short-circuit currents and provide a guide for applying breakers, R. C. Van Sickle, Westinghouse, told the conference. Uniform testing procedures and preferred rating tables enable the manufacturer to concentrate his breaker development work.

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DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-5571) will be received at Denver, Colorado, until 2 p.m., Mountain Standard Time, May 23, 1961, for furnishing three 47,000-kva, 138/79.8- to 11.2-kv, 3-phase, class FOW, power transformers for Flaming Gorge Powerplant, Colorado River Storage Project, Utah-Wyoming. Delivery is desired within 500 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver 25, Colorado. Floyd E. Dominy, Commissioner.

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Letters (*Continued from page 5*)

Paragraph 13—Perhaps industries and municipalities should be the whipping boys. Until recently they have been the great offenders.

Paragraph 15—The concern with thermal pollution is not only because of its effect on other pollution and upon fish but upon the whole ecology of a river or lake and upon the downstream use and re-use of water for a multitude of purposes. Again more research is needed.

Paragraph 16—Quite often the big cold streams are too valuable for recreational purposes to allow any industrial use whatever.

Paragraph 17— . . . I fully appreciate why this paragraph has many mistakes. The 100 pike supposedly caught in the lagoon were 100 bass. The statement that fish seek out the warm water area (during the winter months) is not offset by a statement that during the summer fish leave the area completely and if they do not, rather extensive fish kills result. We have observed these kills and reported them. Our L-D 50 temperatures are somewhat higher than those reported in the literature but not much higher. No plans should be made to raise power plant effluent temperatures until our work has been checked and rechecked. The statement that only the upper 30 inches of the stream is affected by the plant effluent may be true at certain periods but most of the time it is untrue, especially during the critically warm-water, low-water periods. We as a research group cannot uphold these statements.

May I say in closing that:

1. There are water problems.

2. Research is absolutely necessary for solution of these problems. Research must be research—the finding and accurate reporting of events in the area covered.

3. Through adequate research, water use and apportionment must be based on local supply, quality, and local demand—not upon widespread federal and state regulation.

F. J. Trembley
Professor of Ecology
Lehigh University
Bethlehem, Penn.

Books

Cut Industrial Power Costs

Electrical Efficiency in Industrial Plants, by Edwin S. Lincoln. Published by F. W. Dodge Corp, 119 W 40th St, New York 18, N. Y. 235 pages, illustrated. Price $9.50.

This book presents down-to-earth methods of making surveys of power load, voltage, lighting, wiring and electrical protection for electrical systems in industrial plants. Of particular interest is power-factor-correction theory and demonstrations of putting the theory to work, as well as analysis of electric power costs.

This easy-to-read book should be useful to the industrial plant engineer as well as those utility engineers who contact industrial customers.

Poland's Power System

Elektrizitaetswerke und Hochspannungsleitungen in Ostdeutschland und Polen, vor u. nach 1945, by Prof. Dr Karl C. Thalheim. Published in German by the East Europe Institute of the Free University of Berlin, Ehrenbergstrasse 35, Berlin-Dahlem, Germany. 230 pages, with tables and maps; paperbound. Price DM 16.

Reconstruction and expansion of Poland's electric supply facilities since 1950 have been pushed to try to keep up with that land's industrialization. The development of power plants and transmission lines both during this period and the couple of decades preceding are detailed in this study, one of a series by the Institute on the East-block lands. The work is mostly statistics and contains enough text for coherence and unity.

Prof Thalheim points out that the official information available from Polish and other Eastern sources often misstates facts, such as by listing rebuilt or enlarged installations as new.

His title is misleading in including "Ostdeutschland." The study is of Poland, whose present borders embrace Silesia, Pomerania and much of East Prussia.

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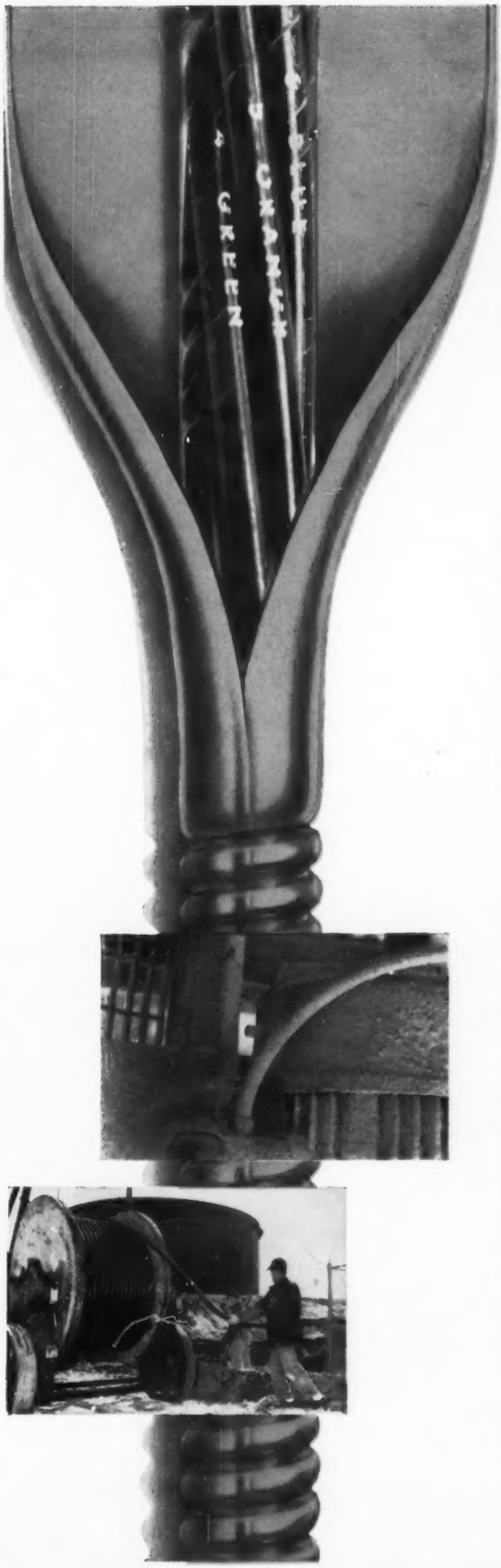

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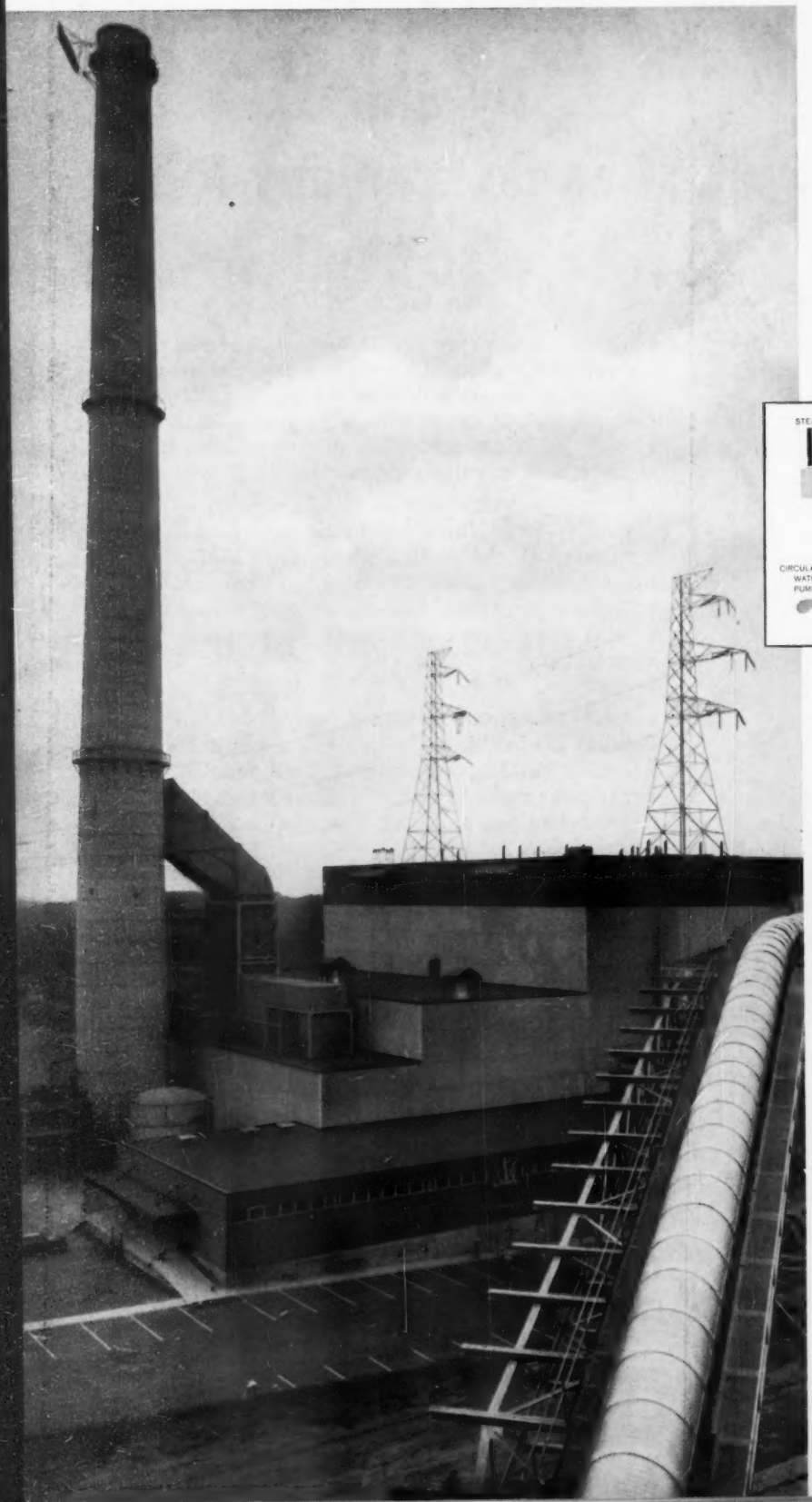
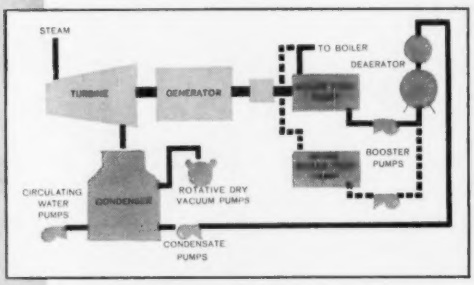


Worthington equipment plays major role in PEPCO achievement

According to the recently issued Federal Power Commission report, Potomac Electric Power Company's Dickerson Station was the most efficient power plant in the U.S. in 1959. PEPCO Engineering Departments worked with Stone & Webster Engineering Corporation to achieve a new low heat rate. Worthington helped by supplying major components in the Fluid Handling Group.



Major fluid handling equipment (shown in red) includes the condensers, circulating water pumps, condensate pumps, rotative dry vacuum pumps, boiler feed and booster pumps and main deaerator to supplement condenser deaeration in protecting the boiler and feed cycle.

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